DOCUMENT RESUME

ED 357 247 CE 063 661

TITLE	Pressure Ulcers in Adults: Prediction and Prevention. Clinical Practice Guideline Number 3.
INSTITUTION	Agency for Health Care Policy and Research (DHHS/PHS), Rockville, MD.
REPORT NO	AHCPR-92-0047; AHCPR-92-0048; AHCPR-92-0050
PUB DATE	May 92
NOTE	101p.
PUB TYPE	Guides - Non-Classroom Use (055) -- Guides - Classroom Use - Instructional Materials (For Learner) (051)
EDRS PRICE	MF01/PC05 Plus Postage.
DESCRIPTORS	*Adults; *Allied Health Occupations Education; Early Intervention; Guidelines; Health Materials; *Health Promotion; Medical Evaluation; *Patient Education; *Prevention; Preventive Medicine; Rating Scales; *Risk
IDENTIFIERS	*Bedsores

ABSTRACT

This package includes a clinical practice guideline, quick reference guide for clinicians, and patient's guide to predicting and preventing pressure ulcers in adults. The clinical practice guideline includes the following: overview of the incidence and prevalence of pressure ulcers; clinical practice guideline (introduction, risk assessment tools and risk factors, skin care and early treatment, mechanical loading and support surfaces, and education); pressure ulcer prediction and prevention algorithm; research agenda; list of 129 references; glossary; and acronym list. Contents of the quick reference guide for clinicians are as follows: the Braden Scale for Predicting Pressure Score Risk, skin care and early treatment guidelines, guidelines regarding mechanical loading and support surfaces, guidelines for educational programs, a staging system, and a pressure ulcer prediction and prevention algorithm. In the patient's guide are the following: definition of pressure ulcers, information on where pressure ulcers form, pressure ulcer risk factors, key steps in preventing pressure ulcers, steps for assuming an active role in one's own care, a table outlining care by risk factors, and addresses for additional information. (MN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED357247

Clinical Practice Guideline
Number 3

Pressure Ulcers in Adults: Prediction and Prevention

BEST COPY AVAILABLE

U.S. Department of Health and Human Services
Public Health Service
Agency for Health Care Policy and Research

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvemer
EDUCATIONAL RESOURCES INFORMATIO CENTER (ERIC)
☒ This document has been reproduced a received from the person or organizatic originating it
☐ Minor changes have been made to improv reproduction quality
• Points of view or opinions stated in this doc ment do not necessarily represent offici OERI position or policy

Pressure Ulcers in Adults

CE063661

The Agency for Health Care Policy and Research (AHCPR) was established in December 1989 under Public Law 101–239 (Omnibus Budget Reconciliation Act of 1989) to enhance the quality, appropriateness, and effectiveness of health care services and access to these services. AHCPR carries out its mission by conducting and supporting general health services research, including medical effectiveness research, facilitating development of clinical practice guidelines, and disseminating research findings and guidelines to health care providers, policymakers, and the public.

The legislation also established within AHCPR the Office of the Forum for Quality and Effectiveness in Health Care (the Forum). The Forum has primary responsibility for facilitating the development, periodic review, and updating of clinical practice guidelines. The guidelines will assist practitioners in the prevention, diagnosis, treatment, and management of clinical conditions.

Other AHCPR components include the following. The Center for Medical Effectiveness Research has principal responsibility for patient outcomes research and studies of variations in clinical practice. The Center for General Health Services Extramural Research supports research on primary care, the cost and financing of health care, and access to care for underserved and rural populations. The Center for General Health Services Intramural Research uses large data sets for policy research on national health care expenditures and utilization, hospital studies, and long-term care. The Center for Research Dissemination and Liaison produces and disseminates findings from AHCPR-supported research, including guidelines, and conducts research on dissemination methods. The Office of Health Technology Assessment responds to requests from Federal health programs for assessment of health care technologies. The Office of Science and Data Development develops specialized data bases and enhances techniques for using existing data bases for patient outcomes research.

Guidelines are available in formats suitable for health care practitioners, the scientific community, educators, and consumers. AHCPR invites comments and suggestions from users for consideration in development and updating of future guidelines. Please send written comments to Director, Office of the Forum for Quality and Effectiveness in Health Care, AHCPR, Executive Office Center, Suite 401, 2101 East Jefferson Street, Rockville, MD 20852.

Clinical Practice Guideline
Number 3

Pressure Ulcers in Adults: Prediction and Prevention

U.S. Department of Health and Human Services
Public Health Service
Agency for Health Care Policy and Research
Rockville, Maryland

AHCPR Publication No. 92–0047
May 1992

Guideline Development and Use

Guidelines are systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical conditions. This guideline was developed by an independent, multidisciplinary panel of private sector clinicians and other experts convened by the Agency for Health Care Policy and Research (AHCPR). The panel employed an explicit, science-based methodology and expert clinical judgment to develop specific statements on patient assessment and management for the clinical condition selected.

Extensive literature searches were conducted and critical reviews and syntheses were used to evaluate empirical evidence and significant outcomes. Peer review and field review were undertaken to evaluate the validity, reliability, and utility of the guideline in clinical practice. The panel's recommendations are primarily based on the published scientific literature. When the scientific literature was incomplete or inconsistent in a particular area, the recommendations reflect the professional judgment of panel members and consultants.

The guideline reflects the state of knowledge, current at the time of publication, on effective and appropriate care. Given the inevitable changes in the state of scientific information and technology, periodic review, updating, and revision will be done.

We believe that the AHCPR-assisted clinical guideline development process will make positive contributions to the quality of care in the United States. We encourage practitioners and patients to use the information provided in this *Clinical Practice Guideline*. The recommendations may not be appropriate for use in all circumstances. Decisions to adopt any particular recommendation must be made by the practitioner in light of available resources and circumstances presented by individual patients.

J. Jarrett Clinton, MD
Administrator
Agency for Health Care Policy and Research

Foreword

The occurrence of pressure ulcers in patients in different settings is high enough to warrant concern, especially in certain high-risk groups. Prevalence in skilled care and nursing home facilities is approximately 23 percent. In the most extensive study of acute care facilities, there was a prevalence of 9.2 percent. Special high-risk populations include quadriplegic patients (60 percent prevalence in one study) and elderly patients admitted for femoral fracture (66 percent incidence).

Prevention of pressure ulcers in adults at risk is the overall goal of this guideline. Most can be prevented, and those Stage I pressure ulcers (nonblanchable erythema of intact skin) that do form need not worsen. Recommendations target four goals: (1) identifying at-risk individuals who need preventive intervention and the specific factors placing them at risk; (2) maintaining and improving tissue tolerance to pressure in order to prevent injury; (3) protecting against the adverse effects of external mechanical forces (pressure, friction, and shear); and (4) reducing the incidence of pressure ulcers through educational programs.

This guideline is intended for clinicians who examine and treat persons at risk of developing pressure ulcers. AHCPR commissioned an external panel of multidisciplinary experts in the field to develop the guideline. Guideline development included a broad range of input from professional and consumer organizations and individuals.

To build a scientific basis for the guideline, the panel reviewed comprehensive literature searches and then evaluated approximately 800 manuscripts. The panel also solicited input from a broad array of organizations and individuals. Testimony was invited at a public meeting. A draft of the guideline was analyzed by experts at a conference sponsored by the National Pressure Ulcer Advisory Panel, the International Association for Enterostomal Therapy, and the Association of Rehabilitation Nurses. In addition, the guideline received peer review (of the literature review and the conclusions reached) and pilot review by health care agencies to evaluate the guideline both conceptually and informally on a small number of patients (some sites also provided a more formal evaluation).

This is the first edition of *Pressure Ulcers in Adults: Prediction and Prevention*; it will be revised and updated as needed. Future editions will reflect new research findings and experience with the incorporation of emerging technologies and innovative approaches. The panel welcomes comments and suggestions on the guideline for use in the next edition. Please send written comments to Director, Office of the Forum for Quality and Effectiveness in Health Care, AHCPR, Executive Office Center, Suite 401, 2101 East Jefferson Street, Rockville, MD 20852.

Panel for the Prediction and Prevention of Pressure Ulcers in Adults

Abstract

This guideline makes specific recommendations to identify at-risk adults and to define early interventions for prevention of pressure ulcers. The guideline may also be used to treat Stage I pressure ulcers (nonblanchable erythema of intact skin). These guideline recommendations are not intended as the basis for care of infants and children, nor do they apply to individuals with existing Stage II or greater pressure ulcers or to individuals who are fully mobile.

Most pressure ulcers can be prevented, and those Stage I pressure ulcers that do appear need not worsen under most circumstances. However, even the most vigilant nursing care may not prevent the development and worsening of ulcers in some very high-risk individuals. In those cases, intensive therapy must be aimed at reducing risk factors (such as improving nutritional status), at preventive measures (such as frequent turning and the use of mattress overlays), and at treatment.

Recommendations target four overall goals: (1) identifying at-risk individuals who need prevention and the specific factors placing them at risk, (2) maintaining and improving tissue tolerance to pressure in order to prevent injury, (3) protecting against the adverse effects of external mechanical forces (pressure, friction, and shear), and (4) reducing the incidence of pressure ulcers through educational programs.

Interventions include early detection maneuvers such as risk factor identification by assessing mobility, nutritional factors, continence, and level of consciousness. Treatments evaluated included those broadly conceptualized as pressure reduction and relief and strategies to maintain tissue tolerance.

This document is in the public domain and may be used and reprinted without special permission, except for those copyrighted materials noted for which further reproduction is prohibited without the specific permission of copyright holders. AHCPR will appreciate citation as to source, and the suggested format is provided below:

Panel for the Prediction and Prevention of Pressure Ulcers in Adults. *Pressure Ulcers in Adults: Prediction and Prevention. Clinical Practice Guideline, Number 3.* AHCPR Publication No. 92–0047. Rockville, MD: Agency for Health Care Policy and Research, Public Health Service, U.S. Department of Health and Human Services. May 1992.

Panel Members

Nancy Bergstrom, PhD, RN, FAAN, *Chair*
Professor of Nursing
College of Nursing
University of Nebraska Medical Center
Omaha, Nebraska
Specialty: Nurse Researcher and Educator

Richard M. Allman, MD
Associate Professor of Medicine
Director of the Division of Gerontology and Geriatric Medicine
University of Alabama at Birmingham
Birmingham, Alabama
Specialty: Geriatric Physician

Carolyn E. Carlson, PhD, RN
Professor of Nursing
Cedarville College
Associate Director of Nursing and Allied Health for Research and Evaluation, Divisions of Nursing and Allied Health, and Department of Research
Rehabilitation Institute of Chicago
Chicago, Illinois
Specialty: Nurse Educator and Researcher

William Eaglstein, MD
Professor and Chairman
Department of Dermatology and Cutaneous Surgery
University of Miami School of Medicine
Miami, Florida
Specialty: Dermatologist

Rita A. Frantz, PhD, RN, FAAN
Associate Professor, College of Nursing
University of Iowa
Clinical Associate in Nursing, Iowa Veteran's Home
Iowa City, Iowa
Specialty: Nurse Educator and Researcher

Susan L. Garber, MA, OTR
Assistant Director for Research
Department of Occupational Therapy
The Institute for Rehabilitation and Research
Assistant Professor
Department of Physical Medicine and Rehabilitation
Baylor College of Medicine
Houston, Texas
Specialty: Occupational Therapist

Davina Gosnell, PhD, RN, FAAN
Professor and Dean
Kent State University School of Nursing
Kent, Ohio
Specialty: Nurse Educator and Researcher

Bettie S. Jackson, EdD, MBA, FAAN
Director of Professional Nursing Services
Moses Division, Montefiore Medical Center
Associate Research Scientist
Columbia University School of Nursing
Bronx, New York
Specialty: Enterostomal Therapy Nurse

Mildred G. Kemp, PhD, RN, CETN, FAAN
Associate Professor
Rush University
College of Nursing
Practitioner/Teacher
Department of Operating Room and Surgical Nursing
Rush-Presbyterian-St. Luke's Medical Center
Chicago, Illinois
Specialty: Enterostomal Therapy Nurse

Thomas A. Krouskop, PhD
Professor, Department of Physical Medicine and Rehabilitation
Baylor College of Medicine
The Institute for Rehabilitation and Research
Houston, Texas
Specialty: Bioengineer

Elena M. Marvel, MSN, MA, RN
State Coordinator
Health Advocacy Services Program in New Jersey
American Association of Retired Persons
Short Hills, New Jersey
Specialty: Consumer Representative

George T. Rodeheaver, PhD
Professor and Director of Plastic Surgery Research
University of Virginia
Health Sciences Center
Charlottesville, Virginia
Specialty: Researcher, Wound Management

George C. Xakellis, MD
Associate Professor of Family Medicine
University of Iowa
College of Medicine
Iowa City, Iowa
Specialty: Family Practice Physician

Acknowledgments

Many organizations and individuals made significant contributions during the development of this guideline, and their assistance only can be briefly noted. Peer reviewers, individuals at institutions that provided pilot review, and consultants are acknowledged individually in the Contributors section.

All persons, organizations, and agencies with an interest in the pressure ulcer guideline were invited to participate at a public meeting held in Washington, DC, on December 6, 1990. The panel gratefully acknowledges the valuable input received.

The guideline certainly benefitted from review at the National Pressure Ulcer Advisory Panel (NPUAP) conference, March 6–8, 1991. Experts analyzed the guideline for its legal, ethical, fiscal, administrative, clinical medicine and nursing, educational, and research impact. Small group sessions analyzed how the guideline would affect acute care, long-term care, and home care. NPUAP, the International Association for Enterostomal Therapy (IAET), and the Association of Rehabilitation Nurses sponsored the conference and suspended plans in order to accommodate the need of the panel for multidisciplinary input.

Contributions of product manufacturers to the guideline development process are also gratefully acknowledged by the panel. Many companies responded to requests for published and unpublished information describing results of product research.

Margaret Coopey, MGA, RN; Marietta Anthony, PhD; Sue Hopkinson, MPP, RN; and Kathleen Hastings, RN, JD, MPH; were health policy analysts for the guideline at different times for the Office of the Forum for Quality and Effectiveness in Health Care, AHCPR. William N. LeVee, Center for Research Dissemination and Liaison, AHCPR, provided editorial review and production management.

Finally, the panel thanks the support staff members for their tireless efforts: Janet Cuddigan, MSN, RN, project coordinator and research analyst; Brenda Bergman, MS, RNC, research analyst; and Elizabeth Gavin, panel secretary.

Contents

Executive Summary 1

1. Overview 7
- Introduction 7
- Incidence and Prevalence 8
- Methodology for Guideline Development 10

2. Clinical Practice Guideline 13
- Introduction 13
- Risk Assessment Tools and Risk Factors 13
- Skin Care and Early Treatment 15
- Mechanical Loading and Support Surfaces 22
- Education 27

3. Algorithm 31

4. Research Agenda 35

References 37

Contributors 45
- Panel for the Prediction and Prevention of Pressure Ulcers in Adults 45
- Consultants 49
- Peer Reviewers 50
- Pilot Review Sites 52

Glossary 55

Acronyms 59

Index 61

Executive Summary

The incidence and prevalence of pressure ulcers are high enough to warrant concern among the hospitalized and nursing home populations as well as among persons receiving care at home. In hospitals, the incidence of pressure ulcers ranged from 2.7 percent (Gerson, 1975) to 29.5 percent (Clarke and Kadhom, 1988); one extensive study of acute care facilities found a prevalence of 9.2 percent (Meehan, 1990). Several subpopulations may be at higher risk, including quadriplegic patients (60 percent prevalence) (Richardson and Meyer, 1981), elderly patients admitted for femoral fracture (66 percent incidence) (Versluysen, 1986), and critical care patients (33 percent incidence) (Bergstrom, Demuth, Braden, 1987).

Among persons in skilled care and nursing home-type facilities, prevalence of pressure ulcers was found to be 23 percent (Langemo, Olson, Hunter, et al., 1989; Young, 1989). The prevalence among persons cared for in home settings with supervision or assistance of professionals is not fully understood because there is little research on the subject.

The purpose of this guideline is to help identify adults at risk of pressure ulcers, to define early interventions for prevention, and to manage Stage I pressure ulcers.

This guideline is intended for adults at risk for development of pressure ulcers. The guideline is not intended as a basis for care of infants and children, nor do recommendations apply to individuals with existing Stage II or greater pressure ulcers or to individuals who are fully mobile. A pressure ulcer is any lesion caused by unrelieved pressure resulting in damage of underlying tissue. Pressure ulcers usually occur over bony prominences and are graded or staged to classify the degree of tissue damage observed.

Stage I pressure ulcers are defined as nonblanchable erythema of intact skin—the heralding lesion of skin ulceration (reactive hyperemia should not be confused with Stage I pressure ulcers). Stage II is defined as partial thickness skin loss involving epidermis and/or dermis; Stage III as full thickness skin loss involving damage or necrosis of subcutaneous tissue that may extend down to, but not through, underlying fascia; and Stage IV as full thickness skin loss with extensive destruction, tissue necrosis or damage to muscle, bone, or supporting structures.

The following limitations in assessment are recognized: (1) identification of Stage I pressure ulcers may be difficult in patients with darkly pigmented skin and (2) when eschar is present, accurate staging of the pressure ulcer is not possible until the eschar has sloughed or the wound has been debrided.

To develop the guideline, AHCPR convened an interdisciplinary non-Federal panel of physicians, nurses, an occupational therapist, a basic scientist, a biomedical engineer, and a health care consumer. In developing the scientific base to support guideline recommendations, the panel

conducted an extensive literature review of pressure ulcers in adults. It also heard public testimony at an open forum and examined information from consultants. A revised draft of the guideline received peer review and pilot review.

Interventions the panel considered included early detection maneuvers, such as risk factor identification, and laboratory tests for screening of nutritional status. Treatments evaluated included those broadly conceptualized as pressure reduction or relief and strategies to maintain tissue tolerance. The panel considered a broad range of interventions but did not select interventions that were not supported by two or more clinical studies and not recommended in clinical practice.

The guideline recommendations are intended for clinicians who examine and treat persons at risk of developing pressure ulcers. These clinicians include family physicians, internists, geriatricians, occupational and physical therapists, nurses, nurse practitioners, and dietitians working in a variety of health care settings such as acute care, rehabilitation, and home- and community-based settings. The recommendations also should be useful to patients and family members, health care administrators, policy analysts, and others.

This guideline's overall goal is prevention of pressure ulcers, which is less costly than treatment, both in terms of human suffering and financial costs. Risk predictor tools improve the ability of practitioners to predict who will or will not develop pressure ulcers. Knowledge of risk status permits the practitioner to target certain individuals for preventive measures. Although preventive measures may be applied with little or no risk to all individuals, some measures are costly; targeting prevention only to persons at risk for developing pressure ulcers will reduce the costs of prevention.

Most pressure ulcers can be prevented, and those Stage I pressure ulcers that do appear need not worsen under most circumstances. However, even the most vigilant nursing care may not prevent the development and worsening of ulcers in some very high-risk individuals. In those cases, intensive therapy must be aimed at reducing risk factors (such as improving nutritional status), at preventive measures (such as frequent turning and mattress overlays), and at treatment.

Guideline recommendations should be viewed in light of the overall goals of patient care. Prevention of pressure ulcers is imperative when the overall goal is to cure an illness, to rehabilitate the individual, or to help the individual live optimally with a chronic illness. However, when an individual is in the latter stages of a terminal illness and is suffering intractable pain, the primary goal of therapy may be to promote comfort and decrease pain. In this case, frequent repositioning, nutritional support, and other strategies to prevent pressure ulcers may not be consistent with the goal of promoting comfort.

Risk Assessment Tools and Risk Factors

Goal: *Identify at-risk individuals needing prevention and the specific factors placing them at risk.*

Bed- and chair-bound individuals or those with impaired ability to reposition should be assessed for additional factors that increase the risk of developing pressure ulcers. These factors include immobility, incontinence, nutritional factors such as inadequate dietary intake and impaired nutritional status, and altered level of consciousness. Individuals should be assessed on admission to acute care and rehabilitation hospitals, nursing homes, home care programs, and other health care facilities. A systematic risk assessment can be accomplished by using a validated risk assessment tool such as the Braden Scale or the Norton Scale. Pressure ulcer risk should be reassessed at periodic intervals.

Skin Care and Early Treatment

Goal: *Maintain and improve tissue tolerance to pressure in order to prevent injury.*

All individuals at risk should have a systematic skin inspection at least once a day, with particular attention to the bony prominences; results should be documented. Skin should be cleansed at time of soiling and at routine intervals. The frequency of skin cleansing should be individualized according to need and/or patient preference. Avoid hot water, and use a mild cleansing agent that minimizes irritation and dryness of the skin. During the cleansing process, care should be taken to minimize the force and friction applied to the skin. Preliminary research suggests some association between dry, flaky, or scaling skin and an increased incidence of pressure ulcers (Guralnik, Harris, White, et al., 1988). Environmental factors leading to skin drying, such as low humidity (less than 40 percent) and exposure to cold, should be minimized. Dry skin should be treated with moisturizers.

Avoid massage over bony prominences. Although such massage has been used for decades, the scientific evidence for using massage to stimulate blood flow and avert pressure ulcer formation is not well established, whereas there is preliminary evidence suggesting it may lead to deep tissue trauma.

Minimize skin exposure to moisture due to incontinence, perspiration, or wound drainage. When these sources of moisture cannot be controlled, underpads or briefs made of materials that absorb moisture and present a quick-drying surface to the skin can be used. Topical agents that act as barriers to moisture may also be used.

Skin injury due to friction and shear forces should be minimized through proper positioning, transferring, and turning techniques. In addition, friction injuries may be reduced by the use of lubricants (such as

corn starch and creams), protective films (such as transparent film dressings and skin sealants), protective dressings (such as hydrocolloids), and protective padding.

Adequate dietary intake of protein and calories should be maintained. When apparently well-nourished individuals develop an inadequate dietary intake of protein or calories, caregivers should first attempt to discover and correct the factors compromising intake and offer support with eating. Other nutritional supplements or support may be needed. If dietary intake remains inadequate and if consistent with overall goals of therapy, more aggressive nutritional intervention such as enteral or parenteral feedings should be considered. For nutritionally compromised persons, a plan of nutritional support and/or supplementation should be implemented to meet individual needs and the overall goals of therapy.

Maintain current activity level, mobility, and range of motion if appropriate. If the potential for improving mobility and activity status exists and is consistent with overall goals of therapy, rehabilitation efforts should be instituted.

Interventions should be monitored and documented. Specific details are needed on who should provide the care, how often, and the supplies and equipment needed. How the care is to be undertaken should be individualized, written, and readily available. Furthermore, results of the interventions and the care being rendered, and adjustment in the interventions, as indicated by the outcomes should be documented. To ensure continuity, documentation of the plan of care must be clear, concise, and accessible to every caregiver.

Mechanical Loading and Support Surfaces

Goal: *Protect against adverse effects of external mechanical forces: pressure, friction, and shear.*

Individuals in bed assessed to be at risk for developing pressure ulcers should be repositioned at least every 2 hours if consistent with overall patient goals. A written schedule for systematically turning and repositioning the individual should be used. Positioning devices such as pillows or foam wedges should be used to keep bony prominences (for example, knees or ankles) from direct contact with one another, again according to a written plan.

Individuals who are completely immobile should have a care plan that includes the use of devices that totally relieve pressure on the heels, most often by raising them off the bed. Donut-type devices should not be used. Ring cushions are known to cause venous congestion and edema. Although few studies have documented their deleterious effects, one study of at-risk patients found that ring cushions (donuts) are more likely to cause than to prevent pressure ulcers (Crewe, 1987).

Other recommendations include not positioning the individual directly on the trochanter when the side-lying position is used and maintaining the head of the bed at the lowest degree of elevation consistent with medical conditions and other restrictions. The amount of time the head of the bed is elevated should be limited. Anyone assessed to be at risk for developing pressure ulcers should be placed on a pressure-reducing device when lying in bed—such as foam, static air, alternating air, gel, or water mattresses. Lifting devices such as a trapeze or bed linen should be used to move, rather than drag, individuals who cannot assist during transfers and position changes.

Uninterrupted sitting by at-risk individuals in chairs or wheelchairs should be avoided. If consistent with overall patient management goals, the individual should be repositioned, shifting the points under pressure, at least every hour or be put back to bed. Individuals who are able to move should be taught to shift weight every 15 minutes. For individuals who sit in wheelchairs or on other sitting surfaces, the use of a pressure-reducing device such as those made of foam, gel, air, or a combination is indicated—but not donut-type devices. Positioning in the chair should include consideration of postural alignment, distribution of weight, balance and stability, and pressure relief. A written plan for the use of positioning devices and schedules may be helpful for chair-bound individuals.

Education

Goal: *Reduce the incidence of pressure ulcers through educational programs.*

The programs should be structured, organized, and comprehensive and directed at all levels of health care providers, patients, and family/caregivers. An educational program for prevention of pressure ulcers should include information on etiology and risk factors, risk assessment tools and their application, skin assessment, selection and/or use of support surfaces, development and implementation of an individualized program of skin care, demonstration of positioning to decrease risk of tissue breakdown, and instruction on accurate documentation of pertinent data.

The educational program should identify those responsible for pressure ulcer prevention, describe each person's role, be appropriate to the audience in terms of level of information presented and expected participation, and be updated regularly to incorporate new and existing techniques or technologies. More continuity of care is reported when team approaches are used and each person on the team has specific, identified responsibilities. Principles of adult learning should be used to develop, implement, and evaluate educational programs; established programs must have built-in mechanisms to evaluate their effectiveness.

1 Overview

Introduction

On December 19, 1989, the Omnibus Budget Reconciliation Act (Public Law 101–239) added a new title IX to the Public Health Service Act establishing the Agency for Health Care Policy and Research (AHCPR). AHCPR's goal is to enhance the quality, appropriateness, and effectiveness of health care services and access to such services. Section 911 of the Act establishes within AHCPR the Office of the Forum for Quality and Effectiveness in Health Care. Section 912 directs the Forum to facilitate the development and periodic review and updating of:

> *Clinically relevant guidelines that may be used by physicians, educators, and health care practitioners to assist in determining how diseases, disorders, and other health care conditions can most effectively and appropriately be prevented, diagnosed, treated, and managed clinically.*

The prediction, prevention, and early treatment of pressure ulcers was selected as one of seven topics for initial guideline development based on this mandate, legislative criteria for guideline topics, input from the Nursing Panel for Guideline Development, and the published report of a Consensus Development Conference on pressure ulcers by the National Pressure Ulcer Advisory Panel (NPUAP, 1989).

This guideline's purpose is to help identify adults at risk of pressure ulcers, to define early interventions for prevention, and to describe treatments for Stage I pressure ulcers. A pressure ulcer was defined by the panel as any lesion caused by unrelieved pressure resulting in damage of underlying tissue. The guideline is not intended as a basis for care of infants and children, nor do recommendations apply to persons with existing Stage II or greater pressure ulcers or to fully mobile persons. Individuals at risk may be seen in community, tertiary care, and other hospitals; in nursing homes and extended care facilities; and in the home.

Guideline recommendations are intended for clinicians who examine and treat persons at risk of developing pressure ulcers. They include family physicians, internists, geriatricians, nurses, and nurse practitioners, physical and occupational therapists, and dieticians in medical-surgical, acute care, rehabilitation, geriatric, home, and other settings. The recommendations may also be useful to patients and family members, health care administrators, policy analysts, and others.

Interventions considered by the panel included early detection maneuvers (risk assessment, skin inspection, and risk factor identification) and laboratory tests for screening of nutritional status. Treatments evaluated by the panel included those broadly conceptualized as pressure

reduction and relief and strategies to maintain tissue tolerance. The panel did not consider interventions unless they were supported by two or more clinical studies or were recommended in current clinical practice.

Pressure ulcers usually occur over bony prominences and are graded or staged to classify the degree of tissue damage observed. The staging of pressure ulcers recommended for use by this panel is consistent with the recommendations of the National Pressure Ulcer Advisory Panel (NPUAP, 1989 Consensus Conference) as derived from previous staging systems proposed by Shea (1975) and the International Association for Enterostomal Therapy (IAET, 1988). The staging is as follows:

Stage I: Nonblanchable erythema of intact skin; the heralding lesion of skin ulceration. Note: Reactive hyperemia can normally be expected to be present for one-half to three-fourths as long as the pressure occluded blood flow to the area (Lewis and Grant, 1925). This should not be confused with a Stage I pressure ulcer.

Stage II: Partial thickness skin loss involving epidermis and/or dermis. The ulcer is superficial and presents clinically as an abrasion, blister, or shallow crater.

Stage III: Full thickness skin loss involving damage or necrosis of subcutaneous tissue that may extend down to, but not through, underlying fascia. The ulcer presents clinically as a deep crater with or without undermining of adjacent tissue.

Stage IV: Full thickness skin loss with extensive destruction, tissue necrosis or damage to muscle, bone, or supporting structures (for example, tendon or joint capsule). Note: Undermining and sinus tracts may also be associated with Stage IV pressure ulcers.

Staging definitions recognize these assessment limitations:

1. Identification of Stage I pressure ulcers may be difficult in patients with darkly pigmented skin.
2. When eschar is present, accurate staging of the pressure ulcer is not possible until the eschar has sloughed or the wound has been debrided.

Incidence and Prevalence

Both the incidence (new cases appearing during a specified period) and prevalence (a cross-sectional count of the number of cases at a specific point in time) of pressure ulcers are difficult to determine because of methodological barriers that prevent generalization from available data. These problems exist in data from acute care hospitals, long-term facilities, and home care settings.

Methodological limitations to interpretation of incidence and prevalence studies were broadly categorized by the NPUAP Consensus Development Conference (NPUAP, 1989). These limitations are (a) difficulty comparing various populations (data collected in tertiary care hospitals are not likely to reflect community hospital populations), (b) data sources ranging from direct observation of patients by trained research personnel to retrieval of data from patient records, and (c) study methods confusing incidence and prevalence and including or excluding Stage I ulcers and segments of the institutional population.

The incidence of pressure ulcers in hospital settings ranged from 2.7 percent (Gerson, 1975) to 29.5 percent (Clarke and Kadhom, 1988). Prevalence by hospital bed ranged from 4 percent (Ek and Boman, 1982) to 69 percent (Ameis, Chiarcossi, and Jimenez, 1980). The prevalence for hospitalized patients varied between 3.5 percent (Shannon and Skorga, 1989) and 29.5 percent (Oot-Giromini, Bidwell, Heller, et al., 1989). In the most extensive study of acute care facilities, Meehan (1990) surveyed 148 hospitals and found a prevalence of pressure ulcers of 9.2 percent.

Several special subpopulations may be at higher risk than the general hospital population. Richardson and Meyer (1981) reported a pressure ulcer prevalence of 60 percent in hospitalized quadriplegic patients. Versluysen (1986) found an incidence of 66 percent in elderly patients admitted for femoral fracture. Orthopedic patients may be at greater risk for pressure ulcer development because of immobility; orthopedic patients with fractures appear to be at greater risk than patients admitted for elective orthopedic procedures (Versluysen, 1985; Jensen and Juncker, 1987). Although few studies have focused on the critical care population, the 33 percent incidence reported by Bergstrom, Demuth, and Braden (1987) and the 41 percent prevalence reported by Robnett (1986) indicate that this may also be a high-risk population.

Among persons in skilled care and nursing home-type facilities, the prevalence ranged from 2.4 percent (Petersen and Bittmann, 1971) to 23 percent (Langemo, Olson, Hunter, et al., 1989; Young, 1989). The few incidence studies in this population report rates in a comparable range (Powell, 1989; Langemo, Olson, Hunter, et al., 1991; Brandeis, Morris, Nash, et al., 1989, 1990). These data are particularly difficult to generalize to other skilled care and nursing home facilities because of the highly variable nature of casemix and staffing. Studies by Brandeis, Morris, Nash, et al. (1989, 1990) demonstrated that the incidence of pressure ulcers increases with length of stay. The prevalence and incidence of pressure ulcers in these facilities deserves further attention to determine the magnitude and cost of the problem and to project the resources needed to increase the effectiveness of patient care.

The prevalence of pressure ulcers among persons who are cared for in home settings with the supervision or assistance of professionals is not fully understood. Barbenel, Jordan, Nicol, et al. (1977) reported a prevalence of 8.7 percent of Stage II ulcers or worse; in a very small

sample (N = 30), Clarke and Kadhom (1988) reported an incidence of 20 percent. The magnitude of the problem among home care patients requires further investigation.

In summary, the incidence and prevalence of pressure ulcers are sufficiently high to warrant concern. Methods for determining the actual incidence and prevalence are complicated by the lack of studies that are widely generalizable and sufficiently controlled in data acquisition methods and pressure ulcer classification systems to draw conclusions. Studies that use large data bases suffer from lack of control of the data acquisition skills of the observers and must be balanced with technically more accurate data acquisition using smaller samples. The staging system recommended by the NPUAP (1989) should be endorsed and used in future studies to increase the generalizability of data. A systematic assessment guide detailing the pressure ulcer sites should be used to prevent errors of omission in measurement. Knowledge of the incidence and prevalence of pressure ulcers by stage, type of health care facility, diagnosis, and mobility and other risk factor deficits will permit better planning for and allocation of services to vulnerable populations.

Methodology for Guideline Development

Guideline development procedures followed the procedures recommended by AHCPR and Steven Woolf, MD, MPH, a consultant to the panel. Panel procedures were further influenced by JoAnn Horsley, PhD, RN, a consultant who was the principal investigator for The Conduct and Utilization of Research in Nursing (CURN), a project that was funded during the late 1970's. This pioneering work in research utilization developed practice protocols based on a critique of available research and synthesis of available knowledge (Haller, Reynolds, and Horsley, 1979).

The methodology recommended by AHCPR was used by the pressure ulcer panel to develop recommendations on the basis of (a) the clinical benefits and harms of potential interventions and (b) relevant health policy issues. The assessment of clinical benefits and harms was intended to determine which practices produce the best health outcome for patients in the aggregate sense. The assessment of health policy issues was intended to address resource constraints (for example, costs of interventions) and feasibility issues that might affect implementation of the panel's recommendations.

Panel members were appointed by AHCPR after a broad range of input was sought from professional and health care consumer organizations and individuals. At least one professional organization endorsed each panel member. The panel consisted of three physicians (family practice, dermatology, and gerontology), five nurses (rehabilitation, aging, acute care, enterostomal therapy, oncology, and management), one occupational therapist (rehabilitation), one basic scientist (plastic surgery research), one biomedical engineer (rehabilitation), and one consumer representative.

Guidelines and standards have traditionally been based on the best judgment of a panel of experts. The pressure ulcer panel was charged with summarizing the scientific base to support guideline recommendations. It is no longer deemed sufficient to use the best judgment of experts without first understanding the scientific data base. For this reason, the National Library of Medicine (NLM) conducted a comprehensive literature review for the panel, which carefully scrutinized clinical benefits and harms and reviewed prevailing practice documented in professional standards and written reports. There was a comprehensive retrieval of published manuscripts and relevant unpublished material. Relevant literature was identified from computerized searches conducted in July and August of 1990 by NLM staff. Bibliographic data bases that were searched included MEDLINE and 20 other data bases. Through these mechanisms, the panel reviewed approximately 12,000 abstracts (including duplicates from several data bases). About 800 manuscripts were evaluated; 27 percent were research manuscripts.

The guideline was written after scientific evidence and expert or professional judgment had been evaluated and the harms and benefits of each recommendation considered. Recommendations were based first on the quality of the direct or indirect supporting evidence that an action would produce a favorable result. Second, the research base suggesting the direct or indirect result must have been replicated in a minimum of one study. It was preferred that multiple studies serve as the basis for recommendations (Haller, Reynolds, and Horsley, 1979). Third, recommendations were supported by common practice as reflected by review articles, chapters in textbooks, and the standards and guidelines of professional organizations. Expert opinion or professional judgment is an important part of guideline development because it is unlikely that there will be an adequate scientific data base to support each recommendation. When research evidence was lacking, expert opinion was used and documented as such.

Based on the experience of the Conduct and Utilization of Research in Nursing (CURN) project, guidelines are most effective when they are specific (Haller, Reynolds, and Horsley, 1979). For this reason, the panel attempted to be as specific as possible while allowing enough flexibility to respect expert judgment and patient preferences in individual cases.

Following completion of the guideline document's first draft, an open forum was held in Washington, D.C., on December 6, 1990. The forum had been announced in the *Federal Register* on November 23, 1990. All persons, organizations, and agencies with an interest in the pressure ulcer guideline were invited to attend and to present written or verbal testimony. A draft version of the document was then presented at a conference held on March 6–8, 1991 and sponsored by the National Pressure Ulcer Advisory Panel, the International Association for Enterostomal Therapy, and the Association of Rehabilitation Nurses (ARN). Over 175 persons attended. The conference enabled participants to provide feedback on the

content and format of the document through formal and informal response papers. Sessions that organized input from hospitals, extended care, and home care representatives also provided input. These suggestions were incorporated into a revised version of the guideline document.

Next, peer review was undertaken. Peer reviewers were selected from:

1. Professional organizations, which were invited to disseminate the guideline to as many reviewers as deemed appropriate and to collate responses for return of a single document to the panel.
2. Participants in the open forum and NPUAP conference and other professional participants who volunteered.
3. Individuals who wrote, phoned, or otherwise identified themselves as willing to review.

A list of potential peer reviewers was maintained throughout the project. Final selection of peer reviewers considered representation from both a broad range of professional disciplines and clinical practice arenas.

Peer reviewers were asked specifically to evaluate the comprehensiveness of the literature review and identify any manuscripts that were omitted or inappropriately or incompletely cited, evaluate the conclusions based on the literature review, and evaluate the guideline recommendations based on practical realities. Comments from peer reviewers were distributed to the panel. Panel deliberations regarding these comments resulted in guideline revisions as appropriate.

The panel subjected the pressure ulcers guideline to pilot review before providing it to AHCPR. Pilot review comprised three specific activities. First, health care agencies were invited to examine the hypothetical impact of the guideline on their setting. Cost, resources, and practicability of implementation were considered. Second, health care agencies were invited to examine the guideline, test it informally on a small number of patients in the practice setting, and provide feedback to the panel. Third, selected sites were asked to provide a somewhat more formal evaluation of the guideline, as time allowed, setting in motion a plan for implementing guideline recommendations. This more in depth testing provided additional useful information prior to final revisions.

Pilot review sites, like peer reviewers, were selected from a list of names submitted to the panel during the process of guideline development. Key organizations representing classifications of health care settings were asked to conduct pilot reviews. A broad diversity of clinical representation was sought. University hospitals, community hospitals, and small rural hospitals were selected, as well as nursing home chains, small private nursing homes, and visiting nurse and other home health care agencies. Attention was also given to regional distribution.

After the results of pilot review were collated and appropriate responses incorporated, the guideline was submitted to AHCPR.

2 Clinical Practice Guideline

Introduction

This *Clinical Practice Guideline* makes recommendations here for the prediction, prevention, and early treatment of pressure ulcers in adults; it also provides a synopsis of supporting evidence for each recommendation. The guideline alone, without supporting rationale, can be found in the accompanying *Quick Reference Guide for Clinicians.* A more complete discussion of relevant research and summary evidence tables can be found in the full *Guideline Report.*

This guideline reflects the state of current knowledge, as set out in the health care literature, regarding the effectiveness and appropriateness of procedures and practices designed to predict and prevent pressure ulcers. The guideline can also be used to treat Stage I pressure ulcers. When panel members analyzed the strength of the evidence supporting each recommendation, they used the following criteria:

A There is good research-based evidence to support the recommendation.

B There is fair research-based evidence to support the recommendation.

C The recommendation is based on expert opinion and panel consensus.

This approach was adapted from *Guide to Clinical Preventive Services* by the Preventive Services Task Force (1989). Evidence ratings are based on the number of studies (quantity), quality of research, number of replications, and consistency of findings.

Risk Assessment Tools and Risk Factors

Goal: *Identify at-risk individuals needing prevention and the specific factors placing them at risk.*

Bed- and chair-bound individuals or those with impaired ability to reposition should be assessed for additional factors that increase risk for developing pressure ulcers. These factors include immobility, incontinence, nutritional factors such as inadequate dietary intake and impaired nutritional status, and altered level of consciousness. Individuals should be assessed on admission to acute care and rehabilitation hospitals, nursing homes, home care programs, and other health care facilities. A systematic risk assessment can be

accomplished by using a validated risk assessment tool such as the Braden Scale or Norton Scale. Pressure ulcer risk should be reassessed at periodic intervals. (Strength of Evidence = A.) All assessments of risk should be documented. (Strength of Evidence = C.)

Rationale. To prevent pressure ulcers, individuals at risk must be identified so that risk factors can be reduced through intervention. The primary risk factors for pressure ulcers are immobility and limited activity levels (Allman, compiled 1991; Berlowitz and Wilking, 1989; Norton, McLaren, and Exton-Smith, 1975; Okamoto, Lamers, and Shurtleff, 1983). Therefore, persons with impaired ability to reposition themselves or those whose activity is limited to bed or any chair should be assessed for their risk of developing a pressure ulcer. To determine the magnitude of risk, the degree to which mobility and activity levels are limited can be quantified. Both the Norton Scale (Norton, McLaren, and Exton-Smith, 1975) and the Braden Scale (Braden and Bergstrom, 1987; Bergstrom, Braden, Laguzza, et al., 1987) assess these factors (reproduced here on pages 15–17). Instructions on use of both scales are available (Norton, 1989; Braden, 1989).

Other risk factors for pressure ulcer development include incontinence, impaired nutritional status, and altered level of consciousness. Incontinence is assessed by the Moisture subscale of the Braden Scale (Braden and Bergstrom, 1987) and the Incontinence component of the Norton Scale (Norton, McLaren, and Exton-Smith, 1975). Nutritional factors are considered indirectly in the General Condition component of the Norton Scale (Norton, 1989) and the Nutritional Status subscale of the Braden Scale (Bergstrom, Braden, Laguzza, et al., 1987). Altered level of consciousness is assessed by the Norton Scale's Mental Condition subscale and the Braden Scale's Sensory Perception subscale.

Numerous risk assessment tools exist; however, only the Braden Scale and the Norton Scale (original and modified) have been tested extensively. The Braden Scale has been evaluated in diverse sites that include medical-surgical units, intensive care units, and nursing homes. The Norton Scale has been tested with elderly subjects in hospital settings.

The reported sensitivity and specificity of these risk assessment tools have varied greatly. This variability probably reflects differences in study settings, populations, and outcome measures. Some studies have included Stage I ulcers as an outcome with inconsistent definitions of these lesions. The degree to which preventive interventions have been implemented in response to the findings of the risk assessments in these studies may have also contributed to the variability in their reported performance. Good interrater reliability for the Braden Scale has been reported (Bergstrom, Braden, Laguzza, et al., 1987). Reliability data are not available for the Norton Scale, and the original version did not include definitions for its subscales (Norton, McLaren, and Exton-Smith, 1975). Modifications of the Norton Scale have included such definitions (Norton, 1989).

Despite the limitations of the Norton and Braden scales, their use ensures systematic evaluation of individual risk factors. No information is currently available to suggest that adaptations of these risk assessment tools or the assessment of any single risk factor or a combination of risk factors predict risk as well as the overall scores obtained by the tools.

The condition of an individual admitted to a health care facility is not static; consequently, pressure ulcer risk requires routine re-examination. The frequency with which such re-evaluations need to be done is unknown. However, if an individual becomes bed- or chair-bound or develops difficulty with repositioning, pressure ulcer risk needs to be assessed. Accurate and complete documentation of all risk assessments ensures continuity of care and may be used as a foundation for the skin care plan.

Norton Scale

		Physical condition	Mental condition	Activity	Mobility	Incontinent	Total score
		Good 4 Fair 3 Poor 2 Very bad 1	Alert 4 Apathetic 3 Confused 2 Stupor 1	Ambulant 4 Walk/help 3 Chairbound 2 Bed 1	Full 4 Slightly limited 3 Very limited 2 Immobile 1	Not 4 Occasional 3 Usually/urine 2 Doubly 1	
Name	Date						

Source: Doreen Norton, Rhoda McLaren, and A.N. Exton-Smith. An investigation of geriatric nursing problems in the hospital. London. National Corporation for the Care of Old People (now the Centre for Policy on Ageing); 1962. Reprinted with permission.

Skin Care and Early Treatment

Goal: *Maintain and improve tissue tolerance to pressure in order to prevent injury.*

1. All individuals at risk should have a systematic skin inspection at least once a day, paying particular attention to the bony prominences. Results of skin inspection should be documented. (Strength of Evidence = C.)

Rationale. It is customary practice to include procedures for inspecting skin in an overall skin care program that also includes interventions. As a result, the exact role that a systematic, comprehensive, and routine skin inspection plays in decreasing the incidence of pressure ulcers has not been identified. For this guideline, it was deemed sufficient that health care professionals advocate skin inspection as fundamental to any plan for

Braden Scale for Predicting Pressure Sore Risk

Patient's Name _____ Evaluator's Name _____

Sensory perception Ability to respond meaningfully to pressure-related discomfort	**1. Completely limited:** Unresponsive (does not moan, flinch, or grasp) to painful stimuli, due to diminished level of consciousness or sedation, OR limited ability to feel pain over most of body surface.	**2. Very limited:** Responds only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness, OR has a sensory impairment which limits the ability to feel pain or discomfort over 1/2 of body.
Moisture Degree to which skin is exposed to moisture	**1. Constantly moist:** Skin is kept moist almost constantly by perspiration, urine, etc. Dampness is detected every time patient is moved or turned.	**2. Moist:** Skin is often but not always moist. Linen must be changed at least once a shift.
Activity Degree of physical activity	**1. Bedfast:** Confined to bed.	**2. Chairfast:** Ability to walk severely limited or nonexistent. Cannot bear own weight and/or must be assisted into chair or wheel chair.
Mobility Ability to change and control body position	**1. Completely immobile:** Does not make even slight changes in body or extremity position without assistance.	**2. Very limited:** Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently.
Nutrition Usual food intake pattern	**1. Very poor:** Never eats a complete meal. Rarely eats more than 1/3 of any food offered. Eats 2 servings or less of protein (meat or dairy products) per day. Takes fluids poorly. Does not take a liquid dietary supplement, OR is NPO[1] and/or maintained on clear liquids or IV[2] for more than 5 days.	**2. Probably inadequate:** Rarely eats a complete meal and generally eats only about 1/2 of any food offered. Protein intake includes only 3 servings of meat or dairy products per day. Occasionally will take a dietary supplement, OR receives less than optimum amount of liquid diet or tube feeding.
Friction and shear	**1. Problem:** Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance. Spasticity, contractures, or agitation leads to almost constant friction.	**2. Potential problem:** Moves feebly or requires minimum assistance. During a move skin probably slides to some extent against sheets, chair, restraints, or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down.

[1]NPO: Nothing by mouth.
[2]IV: Intravenously.
[3]TPN: Total parenteral nutrition.

Source: Barbara Braden and Nancy Bergstrom. Copyright, 1988. Reprinted with permission.

	Date of Assessment				
3. Slightly limited: Responds to verbal commands but cannot always communicate discomfort or need to be turned. OR has some sensory impairment which limits ability to feel pain or discomfort in 1 or 2 extremities.	**4. No impairment:** Responds to verbal commands. Has no sensory deficit which would limit ability to feel or voice pain or discomfort.				
3. Occasionally moist: Skin is occasionally moist, requiring an extra linen change approximately once a day.	**4. Rarely moist:** Skin is usually dry; linen requires changing only at routine intervals.				
3. Walks occasionally: Walks occasionally during day but for very short distances, with or without assistance. Spends majority of each shift in bed or chair.	**4. Walks frequently:** Walks outside the room at least twice a day and inside room at least once every 2 hours during waking hours.				
3. Slightly limited: Makes frequent though slight changes in body or extremity position independently.	**4. No limitations:** Makes major and frequent changes in position without assistance.				
3. Adequate: Eats over half of most meals. Eats a total of 4 servings of protein (meat, dairy products) each day. Occasionally will refuse a meal, but will usually take a supplement if offered. OR is on a tube feeding or TPN[3] regimen, which probably meets most of nutritional needs.	**4. Excellent:** Eats most of every meal. Never refuses a meal. Usually eats a total of 4 or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation.				
3. No apparent problem: Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair at all times.					
	Total score				

preventing pressure ulcers. Skin inspection provides the information essential for designing interventions to reduce risk and for evaluating the outcomes of those interventions.

2. Skin cleansing should occur at the time of soiling and at routine intervals. The frequency of skin cleansing should be individualized according to need and/or patient preference. Avoid hot water, and use a mild cleansing agent that minimizes irritation and dryness of the skin. During the cleansing process, care should be utilized to minimize the force and friction applied to the skin. (Strength of Evidence = C.)

Rationale. Daily activities result in metabolic wastes and environmental contaminants accumulating on the skin. For maximum skin vitality, these potentially irritating substances should be removed frequently. If unexpected contamination occurs, such as fecal or urinary incontinence, the skin should be cleansed as soon as possible to limit chemical irritation. As a person ages, the frequency of routine skin cleansing may decrease because there is less sebum and perspiration. This reduced frequency of cleansing lessens the magnitude of trauma experienced by the more sensitive skin.

Skin injury due to excess thermal energy or the accelerated metabolic activity induced by elevated temperature should be minimized by only using wash water that is comfortable (slightly warm) to the skin.

During the cleansing process, some of the skin's "natural barrier" is removed. The more the barrier is removed, the drier the skin becomes and the more susceptible it becomes to external irritants. Under most conditions, the individual's skin is minimally soiled and can be properly cleansed with a very mild cleansing agent that does not disrupt the "natural barrier."

3. Minimize environmental factors leading to skin drying, such as low humidity (less than 40 percent) and exposure to cold. Dry skin should be treated with moisturizers. (Strength of Evidence = C.)

Rationale. Preliminary research evidence suggests that a weak association may exist between dry, flaky, or scaling skin and an increased incidence of pressure ulcer development (Guralnik, Harris, White, et al., 1988). It also appears that adequate hydration of the stratum corneum helps protect against mechanical insult. The level of stratum corneum hydration decreases with decreasing ambient air temperature, particularly when the relative humidity of the ambient air is low. Further, the development of clinically dry skin may result from a decreased level of relative humidity in the ambient air.

Decreased skin hydration results in reduced pliability, and severely dry skin is associated with fissuring and cracking of the stratum corneum. Also, a number of studies have shown that both the clinical picture of dry skin and measures of stratum corneum hydration generally improve with

the application of various topical moisturizing agents (Wehr, Krochmal, Whitmore, et al., 1986; Kantor, Ballinger, and Savin, 1982; Kligman, 1978). Although efficacy of any specific moisturizing agent has not been established, it would appear prudent to treat clinical signs and symptoms of dry skin with a topical moisturizer. Further, although there is no direct evidence to support efficacy in preventing pressure ulcers, maintenance of ambient environmental conditions (relative humidity and temperature) appears to be prudent to facilitate stratum corneum hydration and minimize the incidence of dry skin.

4. Avoid massage over bony prominences. (Strength of Evidence = B.)

Rationale. Massage over a bony prominence has been used for decades to stimulate circulation, contribute to a sense of patient comfort and well-being, and assist in prevention of pressure ulcers. However, the scientific evidence for using massage to stimulate blood and lymph flow and avert pressure ulcer formation is not well established, whereas there is preliminary evidence suggesting that it may lead to deep tissue trauma.

Ek, Gustavsson, and Lewis (1985) found that 10 of 15 subjects with skin discoloration over their bony prominences demonstrated a lower skin blood flow after massage than before it was initiated. Additionally, all 15 subjects showed a significant decrease in skin temperature after massage ($p<.01$). The potentially deleterious effects of massage on human tissue were documented by Dyson (1978), who on postmortem biopsies found macerated, degenerated tissue in the areas exposed to massage, while nonmassaged individuals showed no evidence of tissue tearing.

From these studies it would appear that the purported benefit of massage on circulation cannot be documented. However, there is evidence to suggest that massage over bony prominences may be harmful.

5. Minimize skin exposure to moisture due to incontinence, perspiration, or wound drainage. When these sources of moisture cannot be controlled, underpads or briefs can be used that are made of materials that absorb moisture and present a quick-drying surface to the skin. For information about assessing and managing urinary incontinence, refer to *Urinary Incontinence in Adults: Clinical Practice Guideline* (available from AHCPR). Topical agents that act as barriers to moisture can also be used. (Strength of Evidence = C.)

Rationale. An individual's skin may be exposed to a variety of substances that are moist: urine, stool, perspiration, or wound drainage. Although these substances may contain factors other than moisture that irritate the skin, moisture alone can make skin more susceptible to injury (Leyden, 1984; Leyden, Katz, Stewart, et al., 1977; Zimmerer, Lawson, and Calvert, 1986). Underpads and briefs are often used to protect the skin of individuals who are incontinent of urine or stool. Because these

products are designed to reduce injury attributed to the moisture associated with urinary and fecal incontinence, it is not unreasonable to assume they would serve a similar function in those instances where the source of moisture is perspiration or wound drainage.

The panel reviewed 22 studies that examined the effects of underpads or briefs on the skin condition of either incontinent adults or infants. An initial screening of these studies showed that some form of control or comparison group was used in 10 of the 14 studies involving incontinent adults and in all 8 studies of infants. Less scientific rigor was evident when the panel looked at the number of investigators who tested findings for statistical significance. In 4 of the 14 studies involving incontinent adults, testing for statistical significance was done (Grant, 1982; Hu, Kaltreider, and Igou, 1990; Keller, Sinkovic, and Miles, 1990; Williams, Foerster, Proctor, et al., 1981). By contrast, inferential statistical tests were used to analyze the data in all eight studies involving infants (Campbell, Seymour, Stone, et al., 1987; Campbell, Bartlett, Sarbaugh, et al., 1988; Davis, Leyden, Grove, et al., 1989; Lane, Rehder, and Helm, 1990; Seymour, Keswick, Hanifan, et al., 1987; Stein, 1982; Zimmerer, Lawson, and Calvert, 1986).

Of the 12 studies tested for statistical significance, 4 articles conveyed enough information for the panel to determine that the investigators were comparing cloth products with products designed to absorb moisture and present a quick-drying interface with the skin. In all four of these studies, investigators reported either a significant improvement in skin condition or a significantly lower incidence of skin rashes for subjects who used products specifically designed to absorb moisture, when compared with subjects who used products made of cloth. It is important to note that the key feature evaluated was not whether the product was disposable but whether the product was specifically designed to absorb moisture and present a quick-drying surface to the skin. There are several reusable products made of fabric that have been so designed.

The guideline for using moisture barriers to protect the skin from the injurious effects of moisture is derived from usual practice and standards that professional organizations have developed. Three studies were reviewed (Kramer and Honig, 1988; Shipes and Stanley, 1981, 1983). Although each study included some type of comparison group, no investigators tested their findings for statistical significance. Furthermore, the diversity of products tested, the lack of replication for specific categories of products, and a variety of methodological problems further limit the extent to which these studies can be presented as research-based evidence.

6. Skin injury due to friction and shear forces should be minimized through proper positioning, transferring, and turning techniques. In addition, friction injuries may be reduced by the use of lubricants (such as corn starch and creams), protective films (such as transparent

film dressings and skin sealants), protective dressings (such as hydrocolloids), and protective padding. (Strength of Evidence = C.)

Rationale. Shear injury occurs when the skin remains stationary and the underlying tissue shifts. This shift diminishes blood supply to the skin and soon results in ischemia and tissue damage. Most shear injuries can be eliminated by proper positioning.

Friction injuries to the skin occur when it moves across a coarse surface such as bed linens. Most friction injuries can be avoided by using appropriate techniques when moving individuals so that their skin is never dragged across the linens.

Voluntary and involuntary movements by the individuals themselves can lead to friction injuries, especially on elbows and heels. Any agent that eliminates this contact or decreases the friction between the skin and the linens will reduce the potential for injury.

7. When apparently well-nourished individuals develop an inadequate dietary intake of protein or calories, caregivers should first attempt to discover the factors compromising intake and offer support with eating. Other nutritional supplements or support may be needed. If dietary intake remains inadequate and if consistent with overall goals of therapy, more aggressive nutritional intervention such as enteral or parenteral feedings should be considered. (Strength of Evidence = C.)

For nutritionally compromised individuals, a plan of nutritional support and/or supplementation should be implemented that meets individual needs and is consistent with the overall goals of therapy. (Strength of Evidence = C.)

Rationale. While the published studies provide evidence for the role of nutrition in the development of pressure ulcers and to a lesser degree for the healing of ulcers, the practice of supplementation is supported by clinical experts (Goode and Allman, 1989; Kaminski, Pinchcofsky-Devin, and Williams, 1989; Lidowski, 1988). These authorities recommend supplementing or supporting intake of protein, calories, Vitamin C, and zinc in particular.

Although data to support expert opinion on nutritional supplementation are scanty, two cohort prospective studies (Berlowitz and Wilking, 1989; Bergstrom and Braden, forthcoming) document the role of poor diet intake in the development of pressure ulcers, particularly the intake of inadequate calories, protein, and iron. For this reason, assessment of nutritional intake and nutritional support is suggested to maintain skin integrity and prevent pressure ulcers.

8. If potential for improving mobility and activity status exists, rehabilitation efforts should be instituted if consistent with the overall goals of therapy. Maintaining current activity level, mobility, and

range of motion is an appropriate goal for most individuals. (Strength of Evidence = C.)

Rationale. Frequent turning, repositioning, and mobility are reported to be essential in reducing the risk of pressure ulcers (Alexander, 1979; Antypas, 1980; Berecek, 1975; Blom, 1985; Braden and Bryant, 1990). Immobility and inactivity have been associated with larger ulcers (Abildgaard and Daugaard, 1979), and bed- and chair-bound persons were more likely to develop ulcers (Berlowitz and Wilking, 1989).

Several investigators have reported the use of active and passive range-of-motion exercises as mechanisms to promote activity and reduce the effects of pressure on tissue (Colburn, 1987; Dimant and Francis, 1988). Encouraging ambulation (Fugill, 1980) and introducing physiotherapy for bedridden individuals are also strongly recommended to reduce the risk of ulcers (Droessler and Maibusch, 1979). Other aspects of rehabilitation practice have also been suggested. These include physical training and exercise (Griffin, 1982); proper positioning, active exercise and ambulation, and weight shifts for those in wheelchairs (Hamilton, Quek, Lew, et al., 1989); and exercise to improve strength, flexibility, coordination, and range of motion (Levine, Simpson, and McDonald, 1989). All programs should be individualized for each person (Lowthian, 1976, 1977, 1979; Braden and Bryant, 1990).

9. Interventions and outcomes should be monitored and documented. (Strength of Evidence = C.)

Rationale. Interventions—with specific details on who should provide the care, how often, what supplies and equipment are needed, and how the care should be undertaken—should be individualized, written, and readily available. Furthermore, results of the interventions and the care being rendered, and adjustment in the interventions as indicated by the outcomes, should be documented.

To ensure continuity of care through a comprehensive, structured, multidisciplinary approach, documentation of the plan of care must be clear, concise, and accessible to every caregiver. Multidisciplinary collaboration includes physicians, nurses, physical and occupational therapists, and dietitians. The plan of care should be periodically re-evaluated.

Mechanical Loading and Support Surfaces

Goal: *Protect against the adverse effects of external mechanical forces: pressure, friction, and shear.*

1. Any individual in bed who is assessed to be at risk for developing pressure ulcers should be repositioned at least every

2 hours if consistent with overall patient goals. A written schedule for systematically turning and repositioning the individual should be used. (Strength of Evidence = B.)

Rationale. There are data supporting a negative relationship between the number of spontaneous movements that bedfast, elderly individuals make and the incidence of pressure ulcers (Exton-Smith and Sherwin, 1961). The panel reviewed two clinical trials in which investigators manipulated the repositioning schedule and measured the effect on the incidence of pressure ulcers in at-risk elderly individuals. In one of these trials, patients who developed fewer pressure ulcers were those who were turned every 2–3 hours when their risk for developing pressure ulcers increased (Norton, McLaren, and Exton-Smith, 1975). In the absence of a suitable control group and statistical testing of outcomes, these results must be viewed tentatively. In the one randomized, controlled trial that the panel reviewed, unscheduled, small shifts in body positioning had no significant effect on the incidence of pressure ulcers in 19 residents of a long-term care facility (Smith and Malone, 1990). However, patients in both the experimental and control groups were turned every 2 hours. The beneficial effects of these significant changes in patients' positioning may have overshadowed any beneficial effects derived from the smaller shifts in body position that constituted the experimental intervention.

2. For individuals in bed, positioning devices such as pillows or foam wedges should be used to keep bony prominences (for example, knees or ankles) from direct contact with one another, according to a written plan. (Strength of Evidence = C.)

Rationale. This guideline is based on usual practice and standards that professional organizations have developed. Written plans for repositioning are endorsed by VanEtten, Sexton, and Smith (1990) and the International Association for Enterostomal Therapy (IAET, 1988). Abruzzese (1985) has developed a positioning chart.

3. Individuals in bed who are completely immobile should have a care plan that includes the use of devices that totally relieve pressure on the heels, most commonly by raising the heels off the bed. Do not use donut-type devices. (Strength of Evidence = C.)

Rationale. Because of the small surface area, it is difficult to redistribute pressure under the heels. Investigators who have measured interface pressure between heels and support surfaces consistently report high pressures in this area. Difficulty in redistributing pressure under the heels and reports of new pressure ulcers on the heels of patients cared for on pressure-reducing devices (Parish and Witkowski, 1980) suggest the heels need extra protection. This is especially likely in individuals who are unable to reposition their lower extremities. Suspension of the heel is the

best remedy. The use of pillows under the length of the lower leg, suspending the heels, will accomplish the goal. Standards of professional organizations and clinical articles promote devices that totally relieve pressure on the heels.

Although ring cushions (donuts) are known to cause venous congestion and edema, few studies have documented their deleterious effects. In a study of at-risk patients, Crewe (1987) found that ring cushions are more likely to cause pressure ulcers than to prevent them.

4. When the side-lying position is used in bed, avoid positioning directly on the trochanter. (Strength of Evidence = C.)

Rationale. Studies that have measured the effect of various side-lying positions on interface pressures and transcutaneous oxygen tension report higher interface pressures and lower transcutaneous oxygen tension when subjects are positioned directly on their trochanters than when positioned off at an angle (Garber, Campion, and Krouskop, 1982; Seiler, Allen, and Stahelin, 1986).

5. Maintain the head of the bed at the lowest degree of elevation consistent with medical conditions and other restrictions. Limit the amount of time the head of the bed is elevated. (Strength of Evidence = C.)

Rationale. Shearing forces are produced when adjacent surfaces slide across one another. Clinically, shear is exerted on the body when the head of the bed is elevated. In this position, the skin and superficial fascia remain fixed against the bed linens while the deep fascia and skeleton slide down toward the foot of the bed. Shear forces are also generated when individuals sitting in a chair slide down in the chair. As a result of shear, blood vessels in the sacral area are likely to become twisted and distorted and tissue may become ischemic and necrotic (Reichel, 1958). Shear forces have been suggested as contributing to the undermining seen in some sacral ulcers. Standards of professional organizations and clinical articles advocate using positioning techniques and devices to help individuals maintain their position in bed or chair.

6. Use lifting devices such as a trapeze or bed linen to move (rather than drag) individuals in bed who cannot assist during transfers and position changes. (Strength of Evidence = C.)

Rationale. Friction occurs when the skin moves against the support surface. Friction is common in individuals who cannot lift sufficiently during a position change or transfer to avoid dragging their skin over the rough surface of bed linens. While friction is most commonly associated with the superficial injuries seen in blisters and abrasions, it may also contribute to more extensive injury. It has been demonstrated that friction

decreases the amount of external pressure required to produce a pressure ulcer (Dinsdale, 1974). Standards of professional organizations and clinical articles promote using devices that help either patients or their caregivers lift them off support surfaces during repositioning and transferring.

7. Any individual assessed to be at risk for developing pressure ulcers should be placed when lying in bed on a pressure-reducing device, such as foam, static air, alternating air, gel, or water mattresses. (Strength of Evidence = B.)

Rationale. Numerous investigators have measured characteristics and properties of a variety of support surfaces. Although the majority of investigators used tissue interface pressure as the basis for comparing these products, a few also compared changes in transcutaneous oxygen tension and capillary blood flow. Most often the subjects have been healthy volunteers, although some investigators have taken their measurements on people with spinal cord injuries, geriatric patients, and patients in acute care settings and hospice settings. Characteristically, the investigators have not included skin condition as an outcome.

The panel reviewed 13 clinical studies that examined the effects of a variety of pressure-reducing devices on the incidence of pressure ulcers in at-risk patients. Six studies were controlled trials without randomization. In several of these studies, either the investigators did not submit their data to statistical testing or there was evidence suggesting that assumptions underlying the statistical tests computed were violated. Most of these studies used patients cared for on a hospital mattress according to a standardized protocol as the control group. In these cases, the incidence and severity of pressure ulcers were consistently lower for patients cared for on the pressure-reducing device. In the one randomized, controlled trial that compared patients cared for on a hospital mattress with patients cared for on either an air or a water mattress, the incidence of pressure ulcers in patients cared for on the hospital mattress was significantly greater (Andersen, Jensen, Kvorning, et al., 1983).

Panel members reviewed three randomized, controlled trials; in each trial two types of pressure-reducing devices were compared. In one study, an air mattress was compared with a water mattress (Andersen, Jensen, Kvorning, et al., 1983). In the second, an alternating pressure pad was compared with a silacore mattress overlay (Daechsel and Conine, 1985). In the third study, the investigators compared a 4-inch, convoluted foam overlay with an alternating pressure mattress (Whitney, Fellows, and Larson, 1984). The results were similar for all three studies—no significant difference in the incidence and severity of pressure ulcers. Although there is evidence that pressure-reducing devices can decrease the incidence of pressure ulcers, there is no evidence to suggest that one type of pressure-reducing device is more effective than another in preventing pressure ulcers.

8. Any person at risk for developing a pressure ulcer should avoid uninterrupted sitting in a chair or wheelchair. The individual should be repositioned, shifting the points under pressure at least every hour or be put back to bed if consistent with overall patient management goals. Individuals who are able should be taught to shift weight every 15 minutes. (Strength of Evidence = C.)

Rationale. The findings of researchers of the etiology of pressure ulcers indicated that prolonged, uninterrupted mechanical loading of the tissue results in breakdown of the tissue (Kosiak, 1959; Reddy and Cochran, 1979). On the basis of the pressure time curve developed by Brand (1976), relief from the level of interface pressure produced during sitting is needed at least every hour and preferably at shorter intervals. Clinical practitioners who work with spinal cord-injured patients report that weight shifts are an effective means of reducing the risk of pressure ulcer formation (Krouskop, Noble, Garber, et al., 1983).

9. For chair-bound individuals, the use of a pressure-reducing device such as those made of foam, gel, air, or a combination is indicated. Do not use donut-type devices. (Strength of Evidence = C.)

Rationale. Based on the results of animal experiments in pressure ulcer formation (Reddy and Cochran, 1979; Lindan, 1961), the risk of developing a pressure ulcer can be diminished by reducing the mechanical loading on the tissue; this can be accomplished by using pressure-reducing devices (Garber, Krouskop, and Carter, 1978; DeLateur, Berni, Hangladarom, et al., 1976; Ferguson-Pell, Cochran, Cardi, et al., 1986). For the device to be effective, it must be individually prescribed for the user to ensure that the device is effective for the person and that the device does not interfere with other aspects of mobility and personal autonomy. The use of pressure-reducing devices allows the user increased latitude when pressure relief must be provided (for example, when push-ups must be done) and also allows more latitude in the timing of nursing care schedules.

Although ring cushions (donuts) are known to cause venous congestion and edema, few studies have documented their deleterious effects. Crewe (1987), in a study of at-risk patients, found that ring cushions are more likely to cause pressure ulcers than to prevent them.

10. Positioning of chair-bound individuals in chairs or wheelchairs should include consideration of postural alignment, distribution of weight, balance and stability, and pressure relief. (Strength of Evidence = C.)

Rationale. Participation in activities of daily living, leisure, and personal interactions requires that a seat provide more than pressure relief. If the seating surface interferes with a person engaging in activities, the

device is often not used, and the protection necessary for maintaining healthy skin is not provided. Seating considerations that promote maximum personal autonomy and healthy life styles include postural alignment, distribution of weight, balance and stability, and pressure relief. Postural alignment is important to reduce the risk of deformities developing that could compromise respiratory function as well as self-care activities. Distribution of a person's weight over the seating surface both influences the person's ability to transfer from the seat and defines the magnitude and location of maximum pressure. By proper distribution of a person's weight over the seating surface, it is possible to transfer the load to the areas that are better able to tolerate the mechanical loading. Balance and stability directly influence mobility, energy expenditure, and function performance.

11. A written plan for the use of positioning devices and schedules may be helpful for chair-bound individuals. (Strength of Evidence = C.)

Rationale. Written plans for repositioning are endorsed by VanEtten, Sexton, and Smith (1990) and the International Association of Enterostomal Therapy (IAET, 1988). The use of positioning devices for wheelchair-bound patients is described by several authors (Hamilton, Quek, Lew, et al., 1989; King and French, 1990).

Education

Goal: *Reduce the incidence of pressure ulcers through educational programs.*

1. Educational programs for the prevention of pressure ulcers should be structured, organized, and comprehensive and directed at all levels of health care providers, patients, and family or caregivers. (Strength of Evidence = A.)

Rationale. Effective pressure ulcer prevention depends on the coordinated efforts of health care professionals in hospital settings and continued implementation of preventive interventions by family and the patient in the home (Dimant and Francis, 1988; Frye, 1986). These efforts have been described in the context of multidisciplinary teams and include an organized program of education and clinical practice (Green, 1976; Khun and Wygonoski, 1984; Levine, Simpson, and McDonald, 1989; Nickel, Waters, and Klein, 1982).

Despite a lack of outcome data, Levine, Simpson, and McDonald (1989) and Hamilton, Quek, Lew, et al. (1989) describe the importance of the interdisciplinary team in pressure ulcer prevention and treatment. While lacking a rigorous research framework, a quality assurance approach (Van

Ness, 1989; Droessler and Maibusch, 1979) and involvement of individuals and their families (Andberg, Rudolph, and Anderson, 1983) have resulted in increased awareness of pressure ulcer risk factors, assessment, prevention, and early treatment. Programs established in spinal cord injury centers often served as models for subsequent pressure ulcer prevention educational programs (Krouskop, Noble, Garber, et al., 1983; Andberg, Rudolph, and Anderson, 1983; Noble, 1981; King, Boyink, and Keenan, 1977; Nickel, Waters, and Klein, 1982; Rothery, 1989; Stover and Fine, 1986). They have been called pressure ulcer clinics, tissue pressure management programs, tissue teams, skin care teams (Tenpas, 1990), task forces (Walsh, 1989), and pressure ulcer committees. Regardless of their names, they all endorse the multidisciplinary, coordinated, structured, comprehensive approach to prevention. With regard to patient and family education, Barnes (1987), Sebern (1987), and Andberg, Rudolph, and Anderson (1983) believe that, when appropriate, the patient and family are integral to prevention and management of pressure ulcers.

2. The educational program for prevention of pressure ulcers should include information on the following items (Strength of Evidence = B):

- **Etiology and risk factors for pressure ulcers.**
- **Risk assessment tools and their application.**
- **Skin assessment.**
- **Selection and/or use of support surfaces.**
- **Development and implementation of an individualized program of skin care.**
- **Demonstration of positioning to decrease risk of tissue breakdown.**
- **Instruction on accurate documentation of pertinent data.**

Rationale. There seems to be a consensus among investigators regarding the essential information that must be included in an effective pressure ulcer prevention program. The seven essential components of a program are listed above. They are reported to be the core of the prevention programs in spinal cord injury and rehabilitation centers (Krouskop, Noble, Garber, et al., 1983; King, Boyink, and Keenan, 1977; Ozer, Lappin, Courtney, et al., 1989); nursing homes (Blom, 1985; California State Department of Health, 1978; Di Domenico and Ziegler, 1989; Dimant and Francis, 1988; Hamilton, Quek, Lew, et al., 1989; McIntyre and Welch, 1987; Reed, 1981); and hospitals (Frye, 1986; Green, 1976; Levine, Simpson and McDonald, 1989; Moody, Fanale, Thompson, et al., 1988; Morison, 1989; Osborne, 1987; Sater, Takano-Stone, Umeh, et al., 1987; Somers and Drake, 1989; Starling, 1990). The most frequently cited topics to be taught include skin monitoring, followed by devices, risk assessment/risk factors, and prevention.

Moody, Fanale, Thompson, et al. (1988) tested the hypothesis that an educational program, without the introduction of new technology, could result in higher quality care and cost savings. After an intensive educational program for nurses and physicians that covered pathogenesis, staging, prevention, and treatment of ulcers, there was a 63 percent decrease in the development of pressure ulcers among elderly hospitalized patient populations. LaMantia, Hirschwald, Goodman, et al. (1987) focused on 42 individuals with spinal cord injury through a didactic program resulting in specific behavioral outcomes. Success, measured as intact skin as a result of the program, was high when measured at 3 months and 1 year.

3. The educational program should identify those responsible for pressure ulcer prevention, describe each person's role, and be appropriate to the audience in terms of level of information presented and expected participation. The educational program should be updated on a regular basis to incorporate new and existing techniques or technologies. (Strength of Evidence = C.)

Rationale. More continuity of care is reported when team approaches are used and each person on the team has specific, identified responsibilities (Khun and Wygonoski, 1984; Dimant and Francis, 1988; Frye, 1986). A variety of techniques for presenting material enhances learning (Simpson, 1988). Lecture and demonstration are the most frequently employed educational methods (Krouskop, Noble, Garber, et al., 1983; LaMantia, Hirschwald, Goodman, et al., 1987; Irvine and Black, 1990; Morley, 1973). Written guides with illustrations are also very appropriate for use by staff who must position and transfer patients and dress wounds (King, Boyink, and Keenan, 1977; California State Department of Health, 1978; Di Domenico and Ziegler, 1989) and for patients or families to use at home (Lovett and Bridle, 1986; Morison, 1989).

Educational programs evaluated by staff and modified to incorporate new approaches are effective in reducing the severity of pressure ulcers (McIntyre and Welch, 1987). Coordinated ongoing programs are successful in reducing the risk of developing pressure ulcers and in preventing progression of ulcers from mild to severe (Van Ness, 1989; Tenpas, 1990; VanEtten, Sexton, and Smith, 1990; Oot-Giromini, Bidwell, Heller, et al., 1989). Systematic ongoing programs are effective if they present accurate and consistent information (Andberg, Rudolph, and Anderson, 1983; Dimant and Francis, 1988).

4. Educational programs should be developed, implemented, and evaluated using principles of adult learning. (Strength of Evidence = C.)

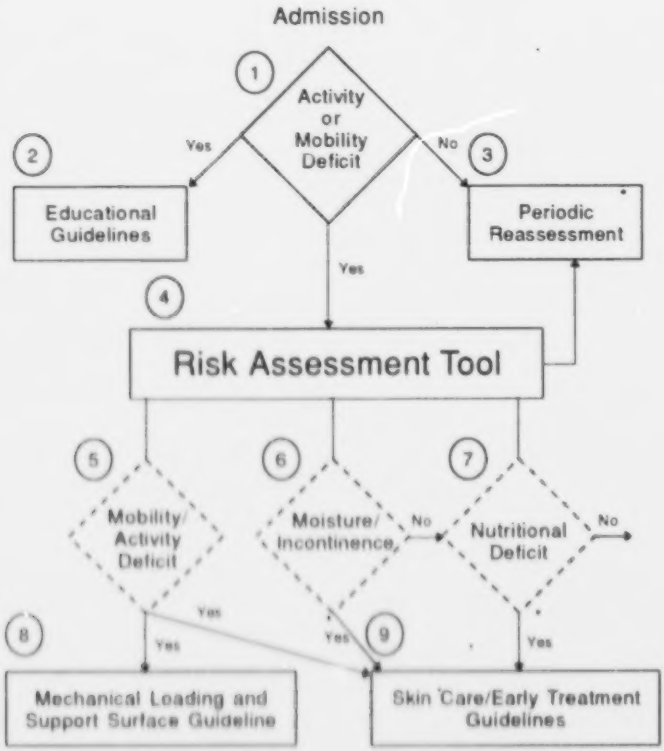
Rationale. The primary purpose of pressure ulcer prevention educational programs is to reduce the occurrence of ulcers. Educational programs must have a built-in mechanism to evaluate their effectiveness in achieving this outcome. Baseline audits establish the incidence of ulcers in a particular facility. Establishing baseline data on pressure ulcer occurrence in a facility (hospital, nursing home, rehabilitation center) enables that facility to develop quality assurance standards (Droessler and Maibusch, 1979; Irvine and Black, 1990). Quality assurance standards are reviewed regularly, especially by facilities that must meet accreditation standards (Commission on Accreditation of Rehabilitation Facilities, Joint Commission on Accreditation of Healthcare Organizations); documentation of compliance reflects changes in outcomes (reduction in number or severity of ulcers). From this point, with the educational program in place, effectiveness based on reduced occurrence or a decrease in severity can be determined (Blom, 1985; Van Ness, 1989). It has been suggested that a pre-education test and a posteducation test be given to evaluate effectiveness of the educational process (Moody, Fanale, Thompson, et al., 1988). However, educational programs must be consistent, comprehensive, and ongoing (Oot-Giromini, Bidwell, Heller, et al., 1989). Evaluation by the patient of the educational program is also recommended when appropriate (Ozer, Lappin, Courtney, et al., 1989).

3 Algorithm

Introduction

An algorithm was developed as a visual display of the conceptual organization, procedural flow, decision points, and preferred management path discussed in the guideline. It begins at the point of admission to an acute care hospital, rehabilitation hospital, nursing home, home care program, or other health care facility or program. Numbers in the algorithm refer to the annotations that follow.

Pressure Ulcer Prediction and Prevention Algorithm



1. **Activity or Mobility Deficit:** Bed- or chair-bound individuals or those whose ability to reposition is impaired should be considered at risk for pressure ulcers. Identification of additional risk factors (immobility, moisture/incontinence, and nutritional deficit) should be undertaken to direct specific preventive treatment regimes.

2. **Educational Program:** Educational programs for the prevention of pressure ulcers should be structured, organized, and comprehensive and directed at all levels of health care providers, patients, and family or caregivers. Refer to Educational Guideline 1–4 (pages 27–30).

3. **Reassessment:** Active, mobile individuals should be periodically reassessed for changes in activity and mobility status. The frequency of reassessment depends on patient status and institutional policy.

4. **Risk Assessment Tools:** Clinicians are encouraged to select and use a method of risk assessment that ensures systematic evaluation of individual risk factors. Many risk assessment tools exist, but only the Norton Scale and Braden Scale have been tested extensively.

   Risk assessment tools include the following risk factors: mobility/activity impairment, moisture/incontinence, and impaired nutrition. Altered level of consciousness (or altered sensory perception) is also identified as a risk factor in most assessment tools. Identification of individual risk factors (boxes 5–7) is helpful in directing care.

5. **Mobility/Activity Deficit:** If there is a deficit, see boxes 8 and 9.

   Mechanical Loading and Support Surface Guideline (pages 22–27)

   For bed-bound individuals:
   - Reposition at least every 2 hours.
   - Use pillows or foam wedges to keep bony prominences from direct contact.
   - Use devices that totally relieve pressure on the heels.
   - Avoid positioning directly on the trochanter.
   - Elevate the head of the bed as little and for as short a time as possible.
   - Use lifting devices to move rather than drag individuals during transfers and position changes.
   - Place at-risk individuals on a pressure-reducing mattress. **Do not use donut-type devices.**

   For chair-bound individuals:
   - Reposition at least every hour.
   - Have patient shift weight every 15 minutes if able.
   - Use pressure-reducing devices for seating surfaces. **Do not use donut-type devices.**

- Consider postural alignment, distribution of weight, balance and stability, and pressure relief when positioning individuals in chairs or wheelchairs.
- Use a written plan.

Skin Care and Early Treatment Guideline 1–4, 6, 8, 9 (pages 15–22)

- Inspect skin at least once a day.
- Individualize bathing schedule. Avoid hot water. Use a mild cleansing agent.
- Minimize environmental factors such as low humidity and cold air. Use moisturizers for dry skin.
- Avoid massage over bony prominences.
- Use proper positioning, transferring, and turning techniques.
- Use lubricants to reduce friction injuries.
- Institute a rehabilitation program.
- Monitor and document interventions and outcomes.

6. **Moisture/Incontinence:** If there is moisture or incontinence, see:

   Skin Care and Early Treatment Guideline 2 and 5 (pages 18–20)

   - Cleanse skin at time of soiling.
   - Minimize skin exposure to moisture. Assess and treat urinary incontinence. When moisture cannot be controlled, use underpads or briefs that are absorbent and present a quick-drying surface to the skin.

7. **Nutritional Deficit:** If there is a nutritional deficit, see:

   Skin Care and Early Treatment Guideline 7 (page 21)

   - Investigate factors that compromise an apparently well-nourished individual's dietary intake (especially protein or calories) and offer him or her support with eating.
   - Plan and implement a nutritional support and/or supplementation program for nutritionally compromised individuals.

Risk should be periodically reassessed. Care should be modified according to the level of risk. Frequency of reassessment depends on patient status and institutional policy.

4 Research Agenda

A comprehensive review of the literature related to the prediction and prevention of pressure ulcers in adults was completed in 1991 by the guideline panel. Recommendations were made in this guideline on the basis of the best available information from that review, but when it was concluded, the panel found that much clearly remains to be studied.

Recommendations for future research focus on several major needs. Specifically, the panel found the following needs:

- Outcome-focused research.
- Research on the relative efficacy of specific interventions and products.
- Basic research related to defining the outcome of treatment.
- Further refinement of risk assessment methods.
- Risk-based, multi-intervention, multisite trials.

Additional issues requiring investigation are related to:

- The relative cost of prevention versus the cost of treatment.
- Ethical decisionmaking related to patient rights and goals of treatment.
- The effect of the guideline on public policy and national outcomes.

Specific methodological problems need to be addressed in future work to increase the quality and trustworthiness of the data. Studies of product efficacy and treatment effectiveness must be conducted on at-risk patients in clinical situations rather than on normal subjects or animals in laboratory settings. These studies must compare equivalent products and use appropriate control groups. The entire care regimen of the control and experimental groups should be clearly defined and equivalent.

Methods for dissemination of knowledge to members of the multidisciplinary team, patients, and their families need to be tested. Further, health care delivery issues that alter implementation of the guideline and protocols need to be understood. These issues include staffing and acuity levels, resources (cost, space, and time), and caregiver sophistication.

References

Abildgaard AU, Daugaard K. [Pressure sores. A study on prevalence]. Ugeskr Laeger 1979 Nov 12;141(46):3147–51. (Dan).

Abruzzese RS. Early assessment and prevention of pressure sores. In: Lee BY, editor. Chronic ulcers of the skin. New York: McGraw-Hill; 1985. p. 1–19.

Alexander M. Teaching the nursing process: adapting the nursing process for use in a surgical unit. Nurs Times 1979 Aug 23;75(34):1443–6.

Allman RM (Division of Gerontology/Geriatrics, University of Alabama at Birmingham). Pressure ulcers among bedridden hospitalized elderly. Unpublished data compiled 1991.

Ameis A, Chiarcossi A, Jimenez J. Management of pressure sores. Comparative study in medical and surgical patients. Postgrad Med 1980 Feb;67(2):177–84.

Andberg MM, Rudolph A, Anderson TP. Improving skin care through patient and family training. Top Clin Nurs 1983 Jul;5(2):45–54.

Andersen KE, Jensen O, Kvorning SA, Bach E. Decubitus prophylaxis: a prospective trial on the efficiency of alternating-pressure air-mattresses and water-mattresses. Acta Derm Venereol (Stockh) 1983;63(3):227–30.

Antypas PG. Management of pressure sores. Curr Probl Surg 1980 Apr;17(4):229–44.

Barbenel JC, Jordan MM, Nicol SM, Clark MO. Incidence of pressure-sores in the Greater Glasgow Health Board area. Lancet 1977 Sep 10;2(8037):548–50.

Barnes SH. Patient/family education for the patient with a pressure necrosis. Nurs Clin North Am 1987 Jun;22(2):463–74.

Berecek KH. Treatment of decubitus ulcers. Nurs Clin North Am 1975 Mar;10(1):171–210.

Bergstrom N, Braden B. A prospective study of pressure sore risk among institutionalized elderly. Westlake Village, CA: J Am Geriatr Soc. Forthcoming.

Bergstrom N, Braden BJ, Laguzza A, Holman V. The Braden Scale for Predicting Pressure Sore Risk. Nurs Res 1987 Jul–Aug;36(4):205–10.

Bergstrom N, Demuth PJ, Braden BJ. A clinical trial of the Braden Scale for Predicting Pressure Sore Risk. Nurs Clin North Am 1987 Jun;22(2):417–28.

Berlowitz DR, Wilking SV. Risk factors for pressure sores. A comparison of cross-sectional and cohort-derived data. J Am Geriatr Soc 1989 Nov;37(11):1043–50.

Blom MF. Dramatic decrease in decubitus ulcers. Geriatr Nurs (New York) 1985 Mar–Apr;6(2):84–7.

Braden BJ. Clinical utility of the Braden Scale for predicting pressure sore risk. Decubitus 1989 Aug;2(3):44–6, 50–1.

Braden B, Bergstrom N. A conceptual schema for the study of the etiology of pressure sores. Rehabil Nurs 1987 Jan–Feb;12(1):8–12.

Braden BJ, Bryant R. Innovations to prevent and treat pressure ulcers. Geriatr Nurs (New York) 1990 Jul–Aug;11(4):182–6.

Brand PW. Pressure sores—the problem. In: Kenedi RM, Cowden JM, Scales JT, editors. Bed sore biomechanics. London: MacMillan Press Ltd.; 1976. p. 19–23.

Brandeis GH, Morris JN, Nash DJ, Lipsitz LA. The epidemiology and natural history of pressure ulcers in elderly nursing home residents. JAMA 1990 Dec 12;264(22):2905–9. Comment in: JAMA 1991 Apr 3;265(13):1688.

Brandeis GH, Morris JN, Nash DJ, Lipsitz LA. Incidence and healing rates of pressure ulcers in the nursing home. Decubitus 1989 May;2(2):60–2.

California State Department of Health. Interdisciplinary approach to the prevention and care of decubitus ulcers. Sacramento: The Department; 1978.

Campbell RL, Bartlett AV, Sarbaugh FC, Pickering LK. Effects of diaper types on diaper dermatitis associated with diarrhea and antibiotic use in children in day-care centers. Pediatr Dermatol 1988 May;5(2):83–7.

Campbell RL, Seymour JL, Stone LC, Milligan MC. Clinical studies with disposable diapers containing absorbent gelling materials: evaluation of effects on infant skin condition. J Am Acad Dermatol 1987 Dec;17(6):978–87.

Clarke M, Kadhom HM. The nursing prevention of pressure sores in hospital and community patients. J Adv Nurs 1988 May;13(3):365–73.

Colburn L. Pressure ulcer prevention for the hospice patient. Strategies for care to increase comfort. Am J Hosp Care 1987 Mar–Apr;4(2):22–6.

Crewe RA. Problems of rubber ring nursing cushions and a clinical survey of alternative cushions for ill patients. Care Sci Pract 1987 Jun;5(2):9–11.

Daechsel D, Conine TA. Special mattresses: effectiveness in preventing decubitus ulcers in chronic neurologic patients. Arch Phys Med Rehabil 1985 Apr;66(4):246–8.

Davis JA, Leyden JJ, Grove GL, Raynor WJ. Comparison of disposable diapers with fluff absorbent and fluff plus absorbent polymers: effects on skin hydration, skin pH, and diaper dermatitis. Pediatr Dermatol 1989 Jun;6(2):102–8.

DeLateur BJ, Berni R, Hangladarom T, Giaconi R. Wheelchair cushions designed to prevent pressure sores: an evaluation. Arch Phys Med Rehabil 1976 Mar;57(3):129–35.

Di Domenico RL, Ziegler WZ. Practical rehabilitation techniques for geriatric aides. Rockville (MD): Aspen Publishers; 1989. 147 p.

Dimant J, Francis ME. Pressure sore prevention and management. J Gerontol Nurs 1988 Aug;14(8):18–25.

Dinsdale SM. Decubitus ulcers: role of pressure and friction in causation. Arch Phys Med Rehabil 1974 Apr;55(4):147–52.

Droessler D, Maibusch RM. Development of a nursing care plan for healing and preventing decubiti. QRB Qual Rev Bull 1979 Aug;5(8):10–4.

Dyson R. Bed sores—the injuries hospital staff inflict on patients. Nurs Mirror 1978 Jun 15;146(24):30–2.

Ek AC, Boman G. A descriptive study of pressure sores: the prevalence of pressure sores and the characteristics of patients. J Adv Nurs 1982 Jan;7(1):51–7.

Ek AC, Gustavsson G, Lewis DH. The local skin blood flow in areas at risk for pressure sores treated with massage. Scand J Rehabil Med 1985;17(2):81–6.

Exton-Smith AN, Sherwin RW. The prevention of pressure sores: significance of spontaneous bodily movements. Lancet 1961 Nov 18;2(7212):1124–6.

Ferguson-Pell M, Cochran GV, Cardi M, Trachtman L. A knowledge-based program for pressure sore prevention. Ann N Y Acad Sci 1986;463:284–6.

Frye BA. A coat of many colors: a program to reduce the incidence of hospital-originated pressure sores. Rehabil Nurs 1986 Jan–Feb;11(1):24–5.

Fugill GC. Pressure sores. Physiotherapy 1980 Feb;66(2):46–7.

Garber SL, Campion LJ, Krouskop TA. Trochanteric pressure in spinal cord injury. Arch Phys Med Rehabil 1982 Nov;63(11):549–52.

Garber SL, Krouskop TA, Carter RE. A system for clinically evaluating wheelchair pressure-relief cushions. Am J Occup Ther 1978 Oct;32(9):565–70.

Gerson LW. The incidence of pressure sores in active treatment hospitals. Int J Nurs Stud 1975;12(4):201–4.

Goode PS, Allman RM. The prevention and management of pressure ulcers. Med Clin North Am 1989 Nov;73(6):1511–24.

Grant R. Washable pads or disposable diapers? Geriatr Nurs (New York) 1982 Jul–Aug; 3(4):248–51.

Green MF. Pressure sores: the team approach. Nurs Times 1976 Feb 26;72(8):292–4.

Griffin ER 3d. Decubitus ulcers, prevention and management: a review. Mil Med 1982 May;147(5):369–71.

Guralnik JM, Harris TB, White LR, Cornoni-Huntley JC. Occurrence and predictors of pressure sores in the National Health and Nutrition Examination survey follow-up. J Am Geriatr Soc 1988 Sep;36(9):807–12.

Haller KB, Reynolds MA, Horsley JA. Developing research-based innovation protocols: process, criteria, and issues. Res Nurs Health 1979 Jun;2(2):45–51.

Hamilton L, Quek P, Lew N, Li K, Topp R. Pressure ulcers: an interdisciplinary protocol for prevention and treatment. Perspectives 1989 Spring;13(1):9–15.

Hu TW, Kaltreider DL, Igou J. The cost-effectiveness of disposable versus reusable diapers. A controlled experiment in a nursing home. J Gerontol Nurs 1990 Feb;16(2):19–24.

International Association of Enterostomal Therapy. Dermal wounds: pressure sores. Philosophy of the IAET. J Enterostomal Ther 1988 Jan–Feb;15(1):4–17.

Irvine A, Black C. Pressure sore practices. Nurs Times 1990 Sep 19–25;86(38):74–8.

Kaminski MV Jr, Pinchcofsky-Devin G, Williams SD. Nutritional management of decubitus ulcers in the elderly. Decubitus 1989 Nov;2(4):20–30.

Kantor I, Ballinger WG, Savin RC. Severely dry skin: clinical evaluation of a highly effective therapeutic lotion. Cutis 1982 Sep;30(3):410–1, 415–6, 419–24.

Keller PA, Sinkovic SP, Miles SJ. Skin dryness: a major factor in reducing incontinence dermatitis. Ostomy Wound Manage 1990 Sep–Oct;30:60–4.

Khun JK, Wygonoski C. A multidisciplinary team approach to decubitus ulcer care. Nurs Homes 1984 Jan–Feb;33(1):29–33.

King RB, Boyink M, Keenan M, editors. Rehabilitation guide. Chicago: The Rehabilitation Institute of Chicago; 1977. The skin; p. 62–80.

King RB, French ET. Procedures to maintain and restore tissue integrity. In: Rehabilitation Institute of Chicago, Division of Nursing. Rehabilitation nursing procedures manual. Rockville (MD): Aspen Publishers; 1990. p. 179–222.

Kligman AM. Regression method for assessing the efficacy of moisturizers. Cosmet Toiletries 1978 Apr;93(4):27–35.

Kosiak M. Etiology and pathology of ischemic ulcers. Arch Phys Med Rehabil 1959 Feb;40(2):62–9.

Kramer D, Honig PJ. Diaper dermatitis in the hospitalized child. J Enterostomal Ther 1988 Jul–Aug;15(4):167–70.

Krouskop TA, Noble PC, Garber SL, Spencer WA. The effectiveness of preventive management in reducing the occurrence of pressure sores. J Rehabil R D 1983 Jul;20(1):74–83.

LaMantia JG, Hirschwald JF, Goodman CL, Wooden VM, Delisser O, Staas WE Jr. A program design to reduce chronic readmissions for pressure sores. Rehabil Nurs 1987 Jan–Feb;12(1):22–5, 16.

Lane AT; Rehder PA, Helm K. Evaluations of diapers containing absorbent gelling material with conventional disposable diapers in newborn infants. Am J Dis Child 1990 Mar;144(3):315–8.

Langemo DK, Olson B, Hunter S, Burd C, Hansen D, Cathcart-Silberberg T. Incidence of pressure sores in acute care, rehabilitation, extended care, home health, and hospice in one locale. Decubitus 1989 May;2(2):42.

Langemo DK, Olson B, Hunter S, Hanson D, Burd C, Cathcart-Silberberg T. Incidence and prediction of pressure ulcers in five patient care settings. Decubitus 1991 Aug;4(3):25–6, 28, 30 passim.

Levine JM, Simpson M, McDonald RJ. Pressure sores: a plan for primary care prevention. Geriatrics 1989 Apr;44(4):75–6, 83–7, 90.

Lewis T, Grant R. Observations upon reactive hyperaemia in man. Heart (London) 1925;12:73–120.

Leyden JJ. Corn starch, Candida albicans, and diaper rash. Pediatr Dermatol 1984 Apr;1(4):322–5.

Leyden JJ, Katz S, Stewart R, Kligman AM. Urinary ammonia and ammonia-producing microorganisms in infants with and without diaper dermatitis. Arch Dermatol 1977 Dec;113(12):1678–80.

Lidowski H. NAMP:.a system for preventing and managing pressure ulcers. Decubitus 1988 May;1(2):28–37.

Lindan O. Etiology of decubitus ulcers: an experimental study. Arch Phys Med Rehabil 1961 Nov;42(11):774–83.

Lovett PA, Bridle MJ. Your skin: an owner's manual. Charlottesville: University of Virginia; 1986.

Lowthian P. Practical nursing: turning clock system to prevent pressure sores. Nurs Mirror 1979 May 24;148(21):30–1.

Lowthian PT. A review of pressure sore prophylaxis. Nurs Mirror Midwives J 1977 Mar 17;144(11):vii–xv.

Lowthian PT. Underpads in the prevention of decubiti. In: Kenedi RM, Cowden JM, Scales JT, editors. Bed sore biomechanics. London: MacMillan Press Ltd.; 1976. p. 141–5.

McIntyre KM, Welch M. Offering consultations on rehabilitation skills to nursing homes. Top Geriatr Rehabil 1987 Jan;2(2):77–82.

Maklebust J, Sieggreen M. Pressure ulcers: guidelines for prevention and nursing management. West Dundee (IL): S-N Publications; 1991. 212 p.

Meehan M. Multisite pressure ulcer prevalence survey. Decubitus 1990 Nov;3(4):14–7.

Moody BL, Fanale JE, Thompson M, Vaillancourt D, Symonds G, Bonasoro C. Impact of staff education on pressure sore development in elderly hospitalized patients. Arch Intern Med 1988 Oct;148(10):2241–3.

Morison MJ. Early assessment of pressure sore risk. Prof Nurse 1989 Jun;4(9):428–31.

Morley MH. Decubitus ulcer management—a team approach. Can Nurse 1973 Oct;69(10):41–3.

National Pressure Ulcer Advisory Panel. Pressure ulcers: incidence, economics, risk assessment. Consensus development conference statement. Decubitus 1989 2(2):24–8.

Nickel LD, Waters RL, Klein NE. Pressure ulcerations: a philosophy of management. Model Syst SCI Dig 1982 Spring;4(1):36–48.

Noble PC. The prevention of pressure sores in persons with spinal cord injuries. New York: World Rehabilitation Fund, International Exchange of Information in Rehabilitation; [1981]. 63 leaves. (World Rehabilitation Fund monograph; no. 11).

Norton D. Calculating the risk: reflections on the Norton Scale. Decubitus 1989 Aug;2(3):24–31. Published erratum appears in Decubitus 1989 Nov;2(4):10.

Norton D, McLaren R, Exton-Smith AN. An investigation of geriatric nursing problems in hospital. London: Churchill Livingstone; 1975. 238 p. Original work published in 1962.

Okamoto GA, Lamers JV, Shurtleff DB. Skin breakdown in patients with myelomeningocele. Arch Phys Med Rehabil 1983 Jan;64(1):20–3.

Oot-Giromini B, Bidwell FC, Heller NB, Parks ML, Wicks P, Williams PM. Evolution of skin care: pressure ulcer prevalence rates pre/post intervention. Decubitus 1989 May;2(2):54–5.

Osborne S. Pressure sores. A quality circle investigation. Nurs Times 1987 Feb 18–24;83(7):73–6.

Ozer MN, Lappin C, Courtney J, Hussey RW. Skin care program: efficacy of patient participation. In: Abstracts Digest of the Fifteenth Annual Scientific Meeting; 1989 April 3–5; Las Vegas, NV. Atlanta (GA): American Spinal Injury Association; 1989. p. 129.

Parish LC, Witkowski JA. Clinitron therapy and the decubitus ulcer: preliminary dermatologic studies. Int J Dermatol 1980 Nov;19(9):517–8.

Petersen NC, Bittmann S. The epidemiology of pressure sores. Scand J Plast Reconstr Surg 1971;5(1):62–6.

Powell JW. Increasing acuity of nursing home patients and the prevalence of pressure ulcers: a ten year comparison. Decubitus 1989 May;2(2):56–8.

Preventive Services Task Force (US). Guide to clinical preventive services: an assessment of the effectiveness of 169 interventions. Baltimore (MD): Williams & Wilkins; 1989. 419 p.

Reddy NP, Cochran GV. Phenomenological theory underlying pressure-time relationship in decubitus ulcer formation [abstract]. Fed Proc 1979 Mar 1;38(3 Pt 2):1153.

Reed JW. Pressure ulcers in the elderly: prevention and treatment utilizing the team approach. Md State Med J 1981 Nov;30(11):45–50.

Reichel SM. Shearing force as a factor in decubitus ulcers in paraplegics. J Am Med Assoc 1958 Feb 15;166(7):762–3.

Richardson RR, Meyer PR Jr. Prevalence and incidence of pressure sores in acute spinal cord injuries. Paraplegia 1981;19(4):235–47.

Robnett MK. The incidence of skin breakdown in a surgical intensive care unit. J Nurs Qual Assur 1986 Nov;1(1):77–81.

Rothery FA. Preliminary evaluation of a pressure clinic in a new spinal injuries unit. Paraplegia 1989 Feb;27(1):36–40.

Sater BL, Takano-Stone J, Umeh L, Garcia MV. Shattering the research mystique. Geriatr Nurs (New York) 1987 Nov–Dec;8(6):334–7.

Sebern M. Home-team strategies for treating pressure sores. Nursing 1987 Apr;17(4):50–3.

Seiler WO, Allen S, Stahelin HB. Influence of the 30 degrees laterally inclined position and the 'super-soft' 3-piece mattress on skin oxygen tension on areas of maximum pressure—implications for pressure sore prevention. Gerontology 1986 May–Jun;32(3):158–66.

Seymour JL, Keswick BH, Hanifin JM, Jordan WP, Milligan MC. Clinical effects of diaper types on the skin of normal infants and infants with atopic dermatitis. J Am Acad Dermatol 1987 Dec;17(6):988–97.

Shannon ML, Skorga P. Pressure ulcer prevalence in two general hospitals. Decubitus 1989 Nov;2(4):38–43.

Shea JD. Pressure sores: classification and management. Clin Orthop 1975 Oct;(112):89–100.

Shipes E, Stanley I. Effects of a liquid copolymer skin barrier for preventing skin problems. Ostomy Manage 1981 Spring;4:19–23.

Shipes E, Stanley I. A study of a liquid copolymer skin barrier for preventing and alleviating perineal irritations in incontinent patients. J Urol Nurs 1983 Oct–Dec;2(3):32–4.

Simpson G. Wound care: time to specialise. Community Outlook 1988 Jun 8:22–4.

Smith AM, Malone JA. Preventing pressure ulcers in institutionalized elders: assessing the effects of small, unscheduled shifts in body position. Decubitus 1990 Nov;3(4):20–4.

Somers C, Drake BE. A pressure sore task force. Nurs Manage 1989 Jan;20(1):80V, 80X.

Starling M. Pressure sore prevention—project improves practice. Nurs Times 1990 Feb 7–13;86(6):40–1.

Stein H. Incidence of diaper rash when using cloth and disposable diapers. J Pediatr 1982 Nov; 101(5):721–3.

Stover SL, Fine PR, editors. Spinal cord injury: the facts & figures. Birmingham: University of Alabama at Birmingham; 1986. 71 p.

Tenpas DM. Multidisciplinary team approach to skin care. Ostomy Wound Manage 1990 Jan–Feb;26:50–8.

Van Ness C. The implementation of a quality assurance study and program to reduce the incidence of hospital-acquired pressure ulcers. J Enterostomal Ther 1989 Mar–Apr;16(2):61–4.

VanEtten NK, Sexton P. Smith R. Development and implementation of a skin care program. Ostomy Wound Manage 1990 Mar–Apr;27:40–54.

Versluysen M. How elderly patients with femoral fracture develop pressure sores in hospital. Br Med J (Clin Res Ed) 1986 May 17;292(6531):1311–3.

Versluysen M. Pressure sores in elderly patients. The epidemiology related to hip operations. J Bone Joint Surg (Br Ed) 1985 Jan;67(1):10–3.

Walsh KC. Using planned change to implement a pressure sore program. J Neurosci Nurs 1989 Aug;21(4):245–9.

Wehr R, Krochmal L, Whitmore C, Yarbrough C. Efficacy of alpha keri after showering for treatment of xerosis. Cutis 1986;384–5.

Whitney JD, Fellows BJ, Larson E. Do mattresses make a difference? J Gerontol Nurs 1984 Sep;10(9):20–5.

Williams TF, Foerster JE, Proctor JK, Hahn A, Izzo AJ, Elliott GA. A new double-layered launderable bed sheet for patients with urinary incontinence. J Am Geriatr Soc 1981 Nov; 29(11):520–4.

Young L. Pressure ulcer prevalence and associated patient characteristics in one long-term care facility. Decubitus 1989 May;2(2):52.

Zimmerer RE, Lawson KD, Calvert CJ. The effects of wearing diapers on skin. Pediatr Dermatol 1986 Feb;3(2):95–101.

Contributors

Panel for the Prediction and Prevention of Pressure Ulcers in Adults

Nancy Bergstrom, PhD, RN, FAAN (Chair)
Professor of Nursing
University of Nebraska Medical Center, Omaha

Dr. Bergstrom is active in research on nutrition and etiology of pressure sores and has been instrumental in the testing and further development of the Braden Scale for Predicting Pressure Sore Risk. She is principal investigator of a grant from the National Center for Nursing Research for further testing of the Braden Scale. Dr. Bergstrom is Chair of the Council of Nurse Researchers, American Nurses Association. She is the first recipient of the Kosiak Award, which is presented by the National Pressure Ulcer Advisory Panel.

Richard M. Allman, MD
Associate Professor of Medicine and Director of the Division of Gerontology and Geriatric Medicine, University of Alabama at Birmingham
Chief of Geriatrics Section, Birmingham Department of Veterans Affairs Medical Center

Dr. Allman serves as a vice-president of the National Pressure Ulcer Advisory Panel and is on the editorial board of *Decubitus*. He is associate editor of the *American Journal of Medicine*. Dr. Allman's research on pressure ulcers has been published in the *Annals of Internal Medicine* and the *New England Journal of Medicine* and as chapters of Kelley's *Textbook of Internal Medicine* and the American Geriatrics Society *Geriatric Review Syllabus*.

Carolyn E. Carlson, PhD, RN
Associate Director of Nursing and Allied Health for Research and Evaluation, Divisions of Nursing and Allied Health, and Department of Research, Rehabilitation Institute of Chicago
Professor of Nursing, Cedarville College
Adjunct Professor, College of Nursing, University of Illinois at Chicago

Dr. Carlson is principal investigator of a 4-year program grant, "Prevention of Pressure Sores after Spinal Cord Injury," and coprincipal investigator of a study of problems after stroke for patients and caregivers. Both are funded by the National Center for Nursing Research. Dr. Carlson is a reviewer for *Research in Nursing and Health* and on the editorial board of *Topics in Geriatric Rehabilitation*.

William Eaglstein, MD
Professor and Chairman, Department of Dermatology and Cutaneous Surgery
University of Miami School of Medicine

Dr. Eaglstein was chairman of the Department of Dermatology, University of Pittsburgh. Currently he is member of the board of directors of the American Academy of Dermatology, the Society of Investigative Dermatology, and the Wound Healing Society. He is a consultant of the Food and Drug Administration. Author of 140 publications, Dr. Eaglstein was a Robert Wood Johnson Health Policy Fellow. Recently he was appointed to the National Advisory Board for Arthritis and Musculoskeletal and Skin Diseases, Department of Health and Human Services.

Rita Ann Frantz, PhD, RN, FAAN
Associate Professor, College of Nursing
University of Iowa

Dr. Frantz has studied biophysical factors in pressure ulcer development. She is now conducting a multicenter clinical trial to evaluate the efficacy of transcutaneous electrical nerve stimulation on healing of recalcitrate pressure ulcers. She serves as a consultant on pressure ulcers and wound management to several long-term care facilities. Dr. Frantz was a consultant to the Priority Expert Panel on Long-Term Care for Older Adults at the National Center for Nursing Research.

Susan L. Garber, MA, OTR
Assistant Director for Research, Department of Occupational Therapy
The Institute for Rehabilitation and Research
Assistant Professor, Department of Physical Medicine and Rehabilitation
Baylor College of Medicine

Mrs. Garber has been involved in pressure ulcer research since 1975, often as principal or coinvestigator. She has published extensively on the topic both in peer-reviewed journals and in books. She is a reviewer for the *American Journal of Occupational Therapy*, the *Archives of Physical Medicine and Rehabilitation*, and the *Journal of Rehabilitation R & D*. Mrs. Garber has served on the board of the Texas Occupational Therapy Association, Gulf Coast East District.

Davina Gosnell, PhD, RN, FAAN
Professor and Dean
Kent State University School of Nursing

Dr. Gosnell created the "Gosnell Scale," a pressure ulcer risk assessment tool. Her research and publication areas include assessment, nursing education and practice, geriatrics, and pressure ulcers, and she is a

reviewer for *Research in Nursing and Health*. Dr. Gosnell has also served as an expert witness on pressure ulcer prevention and care.

Bettie S. Jackson, EdD, MBA, FAAN
Director of Professional Nursing Services
Moses Division, Montefiore Medical Center
Associate Research Scientist, Columbia University School of Nursing

Dr. Jackson is co-editor of the textbook *Principles of Ostomy Care* and is an Enterostomal Therapy Nurse. She has published over 65 papers, is book review editor for *Heart and Lung*, and is on the editorial boards of *Journal of Nursing Administration* and *Cancer Nursing*. She was president of the International Association for Enterostomal Therapy.

Mildred G. Kemp, PhD, RN, CETN, FAAN
Associate Professor, Rush University College of Nursing
Practitioner/Teacher, Department of Operating Room and Surgical Nursing
Rush-Presbyterian-St. Luke's Medical Center, Chicago

Dr. Kemp is a Certified Enterostomal Therapy Nurse and a reviewer for the *Journal of ET Nursing*. She has been principal or coinvestigator on several projects targeting the prediction or prevention of pressure ulcers. She has been published in the *Western Journal of Nursing Research*, the *Journal of Enterostomal Therapy*, and *Research in Nursing and Health* and has made numerous presentations of her research.

Thomas A. Krouskop, PhD
Professor, Department of Physical Medicine and Rehabilitation
Baylor College of Medicine
Director of Rehabilitation Engineering
The Institute for Rehabilitation and Research

Dr. Krouskop's research has encompassed studies of pressure ulcer etiology, the mechanics of support surfaces, and noninvasive methods to detect soft tissue damage due to mechanical loading. He serves as a reviewer for the *Archives of Physical Medicine and Rehabilitation*, *Journal of Biomechanics*, and *Journal of Rehabilitation Research and Development*. Dr. Krouskop is on the editorial board of the *Journal of Tissue Viability*.

Elena M. Marvel, MSN, MA, RN
State Coordinator, Health Advocacy Services
American Association of Retired Persons

Ms. Marvel has spent her professional career in nursing education and primary care of the aged. She has developed and produced instructional materials using a wide variety of media. She has been a faculty member at Seton Hall University, William Paterson College, and County College of

Morris, New Jersey. Ms. Marvel is a member of the boards of directors of the New Jersey National League for Nursing and the Seton Hall University Alumni and is a member of Sigma Theta Tau.

George T. Rodeheaver, PhD
Professor and Director of Plastic Surgery Research
University of Virginia Health Sciences Center, Charlottesville

Dr. Rodeheaver has been the director of the Wound Healing Research Laboratory since its creation in 1972. The primary focus of his active research program is wound management and optimization of wound healing. He has published 2 books, 29 chapters in books, and 154 papers on various aspects of managing wounds. He is president of the National Pressure Ulcer Advisory Panel and a founding member of the Wound Healing Society. He is on the editorial board of *Wounds*.

George C. Xakellis, MD
Associate Professor of Family Practice
University of Iowa College of Medicine

Dr. Xakellis is a member of the American Academy of Family Physicians and the Society of Teachers of Family Medicine. His research areas are pressure ulcers, aging, and computer use in medical education. Dr. Xakellis is a reviewer for the *American Family Physician* and a grant reviewer for the Family Health Foundation.

Consultants

Research Utilization
JoAnne Horsley, PhD, RN, FAAN
Professor, Oregon Health Sciences
University School of Nursing

Consumer
Mary Susan O'Brien, PhD
Public Relations for Satellite
Communications for Learning
(SCOLA), Creighton University
Professor, Omaha Metropolitan
Community College

Methodology
Steven H. Woolf, MD, MPH
Office of Disease Prevention
and Health Promotion
Public Health Service
U.S. Department of Health
and Human Services

Health Care Economics
Teh-Wei Hu, PhD
Chairman, School of Public Health
Department of Social and
Administrative Health Sciences
University of California
at Berkeley

Library Services
Kristine Scannell, MLS
Supervisory Librarian
National Library of Medicine

Nancy N. Woelfl, PhD
Professor and Director
McGoogan Library of Medicine
University of Nebraska
Medical Center

Organizations[1]

American Academy of
Family Physicians
American Association of
Homes for the Aging
American Association of
Retired Persons
American Occupational Therapy
Association
American Podiatric Medical
Association, Inc.
American Physical Therapy
Association
American Nurses Association
Association of Rehabilitation
Nurses
International Association
for Enterostomal Therapy
National Association of
Social Workers, Inc.
National Pressure Ulcer
Advisory Panel
Paralyzed Veterans of America
University Hospital Consortium

---

[1]These organizations were consulted to nominate panel members, provide peer review, and recommend pilot reviewers. Their consultation does not necessarily imply endorsement of the guideline.

Peer Reviewers

Roberta S. Abruzzese, EdD, RN, FAAN
Editor, *Decubitus*
Garden City, New York
Member, ANA Council on Continuing Education and Staff Development

Edna Atwater, RN
President
Dermatology Nurses Association

Hanan S. Bell, PhD
Clinical Policies Analyst
American Academy of Family Physicians

Rosalind Breslow, PhD, RD
Senior Nutritionist
Westat
Rockville, Maryland

Opal F. Brown, PhD, RN, CS
Executive Committee
ANA Council on Medical-Surgical Nursing

Ruth Bryant, MS, RN, CETN
International Association for Enterostomal Therapy

Jane Campbell, MSN, RN, CS, C
Executive Committee
ANA Council on Medical-Surgical Nursing

Norma Clanin, MS, RN, CRRN
Association of Rehabilitation Nurses

Marie Driever, PhD, RN
Chairperson, Executive Committee, ANA Council on Continuing Education and Staff Development

Cecelia Gatston Grindel, PhD, RN
Chairperson, Executive Committee, ANA Council on Medical-Surgical Nursing

Julie Graves-Moy, MD
American Academy of Family Physicians

Mary Hardy, PhD
Assistant Professor
College of Nursing
University of Iowa

E. Rodney Hornbake, III, MD, FACP
Internal Medicine/Geriatrics
Eastern Carolina Internal Medicine, Professional Associates
New Bern, North Carolina

Katherine F. Jeter EdD, ET
Director, Help for Incontinent People
Staff Affiliate, Enterostomal Therapy
Spartanburg Regional Medical Center
Spartanburg, South Carolina

JoAnn Maklebust, MSN, RN, CS
Clinical Nurse Specialist
Surgery/Wound Care
Harper Hospital
Detroit, Michigan

Claudette F. Marseille, MS, RN
Baldwin, New York

Marjorie McPhee, MS, RN
Rehabilitation Clinical Specialist
Boston Veterans Administration Medical Center
Boston, Massachusetts

Sue Morrissey, DNSc, RNC
Executive Committee,
ANA Council on Gerontological Nursing

John Morris
Social Scientist
Associate Director of Gerontological Research Department
Hebrew Rehabilitation Center for Aged
Roslindale, Massachusetts

Bernadette Pohlmann, MS, CRRN, CPQA
Clinical Nurse Educator
Edward Hines, Jr., VA Hospital
Hines, Illinois

Steven I. Reger, PhD
Department of Biomedical Engineering and Applied Therapeutics
The Cleveland Clinic Foundation
Cleveland, Ohio

David M. Smith, PhD
Statistician
Michael Pine and Associates
Chicago, Illinois

Nancy Stotts, EdD, RN
Associate Professor
School of Nursing
Department of Physiological Nursing
University of California, San Francisco
San Francisco, California

Elaine Trefler, MEd, OTR, FAOTA
American Occupational Therapy Association, Inc.
Rockville, Maryland

Catherine Upton, MD
Department of Internal Medicine
Henry Ford Medical Center
Rochester, Michigan

Eric Wall, MD, MPH
American Academy of Family Physicians

Kristy Wright
President
International Association for Enterostomal Therapy

Organizations[2]

American Occupational Therapy Association, Inc.
American Academy of Family Physicians
American Nurses Association
Association of Rehabilitation Nurses
International Association for Enterostomal Therapy

---

[2]These organizations provided peer review. Their review does not necessarily imply endorsement of the guideline.

Pilot Review Sites

University of Illinois Hospital
and Clinics
Chicago, Illinois
Barbara Sadler, BSN, RN, CETN
Jill Arzouman, RN
Mimis Cohen, MD
Jeri LaPlume, RN
Richard Nelson, MD
Marilyn Neuman, RN
Judy Schaller, RN
Julie Welsh

Thomas Jefferson University
Hospital
Philadelphia, Pennsylvania
Lauren Sargent, MSN, RN
Lisa Zacchei, MSN, RN
Mary Anne Griffin,
BSN, RN, CETN
Karen Flaherty,
OxLER, MSN, RN

Medical Personnel Pool
Pembroke Pines, Florida
Gina Shull, MSN, RN
Marnie Cardillo, RN
Ginny Bumgarden, RN

University of Rochester
Medical Center
Rochester, New York
Diane Breton, MS, RN, CRRN
Judith Baggs, PhD, RN
Janet Gelein, MS, RN

Silver Cross Hospital
Joliet, Illinois
Sharon Baranoski,
MSN, RN, CETN
Andrea McIntosh,
BSN, RN, CETN
Lisa Cooper, RN
Eileen Raher, MSN, RN, ET
Mary Cardy, BHS, RN, CETN

Seattle Veterans Administration
Medical Center
Seattle, Washington
Frankie Manning, MN, RN
Richard Buhrer, MN, RN

Marian Franciscan Home
Milwaukee, Wisconsin
Nancy Gretzinger
Bernadette Kolbeck, MSN, RN

Magee Rehabilitation Hospital
Philadelphia, Pennsylvania
Helen Cioschi,
CRNP, MSN, CRRN
Christopher Formal, MD
Judy Hirschwald, LSW
Carol Boeker, PT
Cyndy Kraft Fine, MSN, CRRN
Carol Goodman, MSN, CRRN
Susan Chase, MSN, RN, CRRN
Jody Hill, MSN
Liz Emery, RD
Linda Heileg, OTR/L
Marianne Loftus, MS, CTRS
William Staas, Jr., MD

University of Nebraska
Medical Center
Omaha, Nebraska
Carol Wilson, RN, MA
Fannie Gaston-Johansson,
DrMedSc, RN
Lisa Strohmyer, MSN, RN
Mary Elrod, MSN, RN
Lynn Weaver, MSN, RN
Carol Smith, RN–C, MPA

St. Joseph Medical Center
Albuquerque, New Mexico
Fran Carver, RN, BSN, CETN

St. Joseph Hospital
and Health Care Center
Chicago, Illinois
Rhoda Pomerantz,
MD, MPH, FACP
Catherine Nurmela, RN
Mary Rethe
Carol Kaplin, RN, CETN
Laura Kelly, PT
Janet Azzarello
Nancy R. Meyer, RN, CS
Andrew Gorchinsky, MD
Todd Grendon, MD

Harper Hospital
Detroit, Michigan
Mary Sieggreen, MSN, RN
JoAnn Maklebust, MSN, RN, CS
Mary Ann Ducharme,
MSN, RN, CCRN
Morris Magnan, BSN, RN
Sharon Dunn, BSN, RN
Donna Weiss-Davenport,
BSN, RN, OCN
Daisy Saliganan, BSN, RN
Mary Berry, BSN, RN, CETN
Lynn Chiesa, BSN, RNC
Debbie Richett, RNC
Mary Ann Miloch, RN
Lynn Said, PT
Laura Roy, BSN, RN, OCN
Joanne Martin, BSN, RN, CETN

Visiting Nurse Association
Dallas, Texas
Virginia Hare, RN

University of Cincinnati
Hospital Medical Center
Cincinnati, Ohio
Arlene C. Miller, RN

Beatrice Community Hospital
Beatrice, Nebraska
Michele Tegtmeier, MSN, RN
Maggie Spilker, BSN, RN

The Cleveland Clinic Foundation
Cleveland, Ohio
Betsy Kuhn, MSN, RN
Dennis Jahnigen, MD
Marsha Orsolits Stevic, PhD, RN
Anna Pignanelli, BSN
Linda Lewicki, MSN
Christine Wynd, PhD, RN
Thomas Keyes, MD
Sharon Coulter, MSN, MBA
Marty Atkins, BSN
Loretta Taggert, BSN
Gretchen Krivanek, RN
Paula Erwin-Toth, MSN
Mary Leeson, BSN
Karen Smith, BSN

Omaha Veterans Administration
Medical Center
Omaha, Nebraska
Marie Bohls, RN
Charlotte Thiessen, Dietetics
Jodi Elliott, PT

University Hospital Consortium,
Technology
Oak Brook, Illinois
Advancement Center
Peter H. Vlasses, PharmD

Visiting Nurse Association
Omaha, Nebraska
Karen Martin, MSN, RN, FAAN

South Mississippi Home Health,
Inc.
Hattiesburg, Mississippi
Mary Stainton, RN, C, MS
Sandra Byrd, RN
Tisa Davis, RN
Jeannie Fortenberry, RN
Wanda Hull, RPT
Sharon Lucy, RN
Karen Utterback, RN
Cindy Wilson, RN
Carol Zitterkopf, BS, RN, CETN

Glossary

Air Fluidized Bed: Class of support devices that uses a high flow rate of air to fluidize a fine particulate material such as sand to produce a support medium that has characteristics very similar to a liquid.

Air Flotation Bed: Generic descriptor for low air loss beds and air fluidized beds.

Completely Immobile: Inability to move or reposition without assistance.

Debride: Removal of foreign material and dead or damaged tissue.

Dry Lubricant: Solid material usually in the form of a very thin film or powder: corn starch, copolymer, or teflon.

Dynamic Support Surface: Pressure-reducing device that is designed to cyclically change its support characteristics; examples include alternating air mattresses and mechanical seats that change shape and redistribute pressure.

Eschar: Thick, leathery, necrotic, devitalized tissue.

Interface Pressure: Force per unit area that acts perpendicularly between the body and the support surface. This parameter is affected by the stiffness of the support surface, the composition of the body tissue, and the geometry of the body being supported.

Low Air Loss Bed: Class of support devices that is characterized by a system of air-filled pillows that act much like a static air-filled device. The bed is composed of a large number of pillows in which the inflation pressure can be adjusted so that the support characteristics of the bed are matched to those of the body being supported.

Lubricant: Substance used to lower the coefficient of friction between two other materials.

Mechanical Loading: Mechanical forces that may contribute to development of pressure ulcers (pressure, friction, and shear).

Moisture: Skin moisture, primary sources of which include perspiration, urine, feces, drainage from wounds, or fistulas (Braden and Bergstrom, 1987).

Necrosis: Death of tissue.

Nonblanchable Erythema: Redness of skin surface that persists when pressure is applied.

Pressure Reduction: Reduction of interface pressure, not necessarily below capillary-closing pressure.

Pressure Relief: Reduction of interface pressure below capillary-closing pressure (adapted from Maklebust and Sieggreen, 1991).

Pressure Ulcer: Any lesion caused by unrelieved pressure resulting in damage of underlying tissue. Pressure ulcers are usually over bony prominences and are graded or staged to classify the degree of tissue damage observed. The staging of pressure ulcers recommended for use by this panel is consistent with the recommendations of the National Pressure Ulcer Advisory Panel (NPUAP, 1989) as derived from previous staging systems proposed by Shea (1975) and the International Association for Enterostomal Therapy (IAET, 1988). The staging is as follows:

Stage I: Nonblanchable erythema of intact skin; the heralding lesion of skin ulceration. Note: Reactive hyperemia can normally be expected to be present for one-half to three-fourths as long as the pressure occluded blood flow to the area (Lewis and Grant, 1925). This should not be confused with a Stage I pressure ulcer.

Stage II: Partial thickness skin loss involving epidermis and/or dermis. The ulcer is superficial and presents clinically as an abrasion, blister, or shallow crater.

Stage III: Full thickness skin loss involving damage or necrosis of subcutaneous tissue that may extend down to, but not through, underlying fascia. The ulcer presents clinically as a deep crater with or without undermining of adjacent tissue.

Stage IV: Full thickness skin loss with extensive destruction, tissue necrosis, or damage to muscle, bone, or supporting structures (for example, tendon or joint capsule). Note: Undermining and sinus tracts may also be associated with Stage IV pressure ulcers.

Staging definitions recognize the following limitations:

1. Assessment of Stage I pressure ulcers may be difficult in patients with darkly pigmented skin.
2. When eschar is present, accurate staging of the pressure ulcer is not possible until the eschar has sloughed or the wound has been debrided.

Reactive Hyperemia: Reddening of the skin caused by blood rushing back into ischemic tissue (Maklebust and Sieggreen, 1991).

Repositioning: Any change in body position that removes pressure from tissue overlying bony prominences. Periodic repositioning of chair-bound and bed-fast individuals is one of the most basic and frequently used methods of pressure reduction. The overall goal of repositioning is to allow tissue reperfusion prior to ischemic tissue changes. Repositioning implies a sustained relief of pressure, not just a temporary shift. Recommendations for frequency of repositioning and specific repositioning techniques can be

found in the body of this document. Recommendations should be individualized according to the level of risk and specific goals of the patient.

Sebum: Secretion of the sebaceous glands.

Shear: Force per unit magnitude of the area acting parallel to the surface of the body. This parameter is affected by the pressure, the coefficient of friction between the materials contacting each other, and how much the body interlocks with the support surface.

Static Support Surface: Pressure-reducing device designed to provide support characteristics that do not cycle in time. Examples include foam overlays and water mattresses.

Stratum Corneum: Outermost layer of the epidermis.

Tissue Tolerance: The ability of both the skin and its supporting structures to endure the effects of pressure without adverse sequelae (Braden and Bergstrom, 1987).

Topical Agents: For the purposes of this document, topical agents are a broad category of creams, lotions, and skin preparations applied externally. Some topical agents may serve as moisture barriers, protecting the skin from external sources of moisture.

Trochanter: Bony prominence on the upper part of the femur.

Acronyms

AHCPR	Agency for Health Care Policy and Research
ANA	American Nurses Association
ARN	Association of Rehabilitation Nurses
CURN	Conduct and Utilization of Research in Nursing
DHHS	U.S. Department of Health and Human Services
IAET	International Association for Enterostomal Therapy
NLM	National Library of Medicine
NPUAP	National Pressure Ulcer Advisory Panel
OBRA	Omnibus Budget Reconciliation Act
PHS	Public Health Service

Index

A

Agency for Health Care Policy and Research (AHCPR), 7, 10
Air flotation bed, 55
Air fluidized bed, 55
Air mattresses, 25
Altered level of consciousness, 3, 13, 32
Alternating pressure pads, 25
Ambulation, 22
Association of Rehabilitation Nurses (ARN), 12
At-risk individuals
  identification of, 3, 13, 14
  research to be conducted on, 35

B

Bed-bound patients, 4–5, 23–25, 32
Beds
  air flotation, 55
  air fluidized, 55
  elevation for head of, 5, 24
  low air loss, 55
Braden Scale, 3, 14–17, 32, 45
Briefs, 3, 19–20

C

Chair-bound patients, 5, 26–27, 32–33
Completely immobile, 55
Conduct and Utilization of Research in Nursing (CURN), 10, 11
Consensus Development Conference (NPUAP), 7–9
Corn starch, 4, 20
Critical care patients, 1, 9

D

Debride, 1, 8, 55, 56
Dietary intake
  maintenance of adequate, 4, 21
  as risk factor, 3, 13, 14
Documentation
  of interventions, 4, 22
  of risk assessment, 14
  of skin inspection, 3, 15
Donut-type devices, 4–5, 23, 24, 26, 32
Dry lubricant, 55
Dry skin, 3, 18–19
Dynamic support surface, 55

E

Educational programs
  approaches to, 27–28, 32
  components of, 5, 28–29
  effectiveness of, 5, 29–30
Elderly patients. *See* Femoral fracture patients
Erythema, nonblanchable, 55
Eschar
  definition of, 55
  presence of, 1, 8

F

Femoral fracture patients, iii, 1, 9
Foam wedges, 4, 23
Friction injuries, 3, 20, 24–25

G

Guide to Clinical Preventive Services (Preventive Services Task Force), 13
Guideline Report, 13

H

Heels, pressure-relieving devices for, 4, 23–24
Home care patients, 1, 9–10
Hospitals, iii, 1, 9
Hydrocolloids, 4, 21
Hyperemia, reactive, 1, 56

I

IAET. *See* International Association for Enterostomal Therapy
Immobile patients. *See also* Mobility
  completely, 55
  pressure-relieving devices for, 23–24
  ulcer risk in, 3, 13
  ulcer size in, 22

Incontinence
  assessment of, 14
  as risk factor, 3, 13, 14, 32
  use of underpads or briefs for, 20
Infants, effect of underpads or briefs on skin of, 20
Interface pressure
  definition of, 55
  produced from sitting, 26
International Association for Enterostomal Therapy (IAET), 8, 11, 23, 27
Interventions
  documentation of, 4, 22
  guideline recommendations for, 2, 7–8
  for nutritionally compromised individuals, 4, 21

L

Lifting devices, 5, 24–25
Low air loss bed, 55
Lubricants, 3–4, 20, 33, 57

M

Massage, 3, 19, 33
Mattresses, 5, 25
Mechanical loading
  definition of, 55
  guidelines for, 4–5, 23–27, 32–33
MEDLINE, 11
Methodology, guideline, 2, 10–12
Mobility. *See also* Immobile patients
  deficit in, 31, 32
  maintenance or improvement of, 4, 21–22
Moisture
  definition of, 55
  skin exposure to, 3, 19–20
Moisturizers, 3, 18, 19

N

National Library of Medicine (NLM), 11
National Pressure Ulcer Advisory Panel (NPUAP), 7–9, 11–12
Necrosis, 1, 8, 24, 55, 56
Nonblanchable erythema, iii, v, 1, 8, 55, 56
Norton Scale, 3, 14–15, 32
NPUAP. *See* National Pressure Ulcer Advisory Panel
Nursing Panel for Guideline Development, 7
Nursing homes, 1, 9
Nutritional status
  assessment of, 14
  interventions to maintain, 4, 21
  laboratory tests for screening of, 7
  as risk factor, 3, 13, 14, 32

O

Office of the Forum for Quality and Effectiveness in Health Care, 7
Omnibus Budget Reconciliation Act of 1989 (P.L. 101–239), 7
Orthopedic patients, 1, 9

P

Panel members, 10–11, 45–48
Peer reviewers, 2, 12, 50–51
Physiotherapy, 22
Pillows, 4, 23, 24
Positioning devices
  use of, 4, 23, 24
  written plans for, 27
Postural alignment, 5, 26, 27
Pressure reduction
  definition of, 55
  devices for, 4–5, 23–27
Pressure relief
  definition of, 56
  for sitting positions, 26
Pressure time curve, 26
Pressure ulcer guidelines
  methodology used for, 10–12
  overview of, 13
  regarding educational programs, 5, 27–30
  regarding mechanical loading and support surfaces, 4–5, 23–27, 32–33
  regarding risk assessment tools and risk factors, 3, 13–17, 31, 32
  regarding skin care and early treatment, 3–4, 15, 18–22, 33

Pressure ulcer prevention
algorithm used for, 31–33
educational programs for, 5, 27–30, 32
goals for, iii
guidelines for, 2
Pressure ulcers
definition and stages of, 1, 7, 8, 56
incidence and prevalence of, iii, 1, 8–10
interventions for. *See* Interventions
limitations in assessment of, 1, 8
prevention of, iii
research agenda for, 35
staging of, 8.
See also individual stages
Protective dressings, 4, 21
Protective films, 4, 21
Protective padding, 4, 21
Public Health Service Act, Title IX, 7

Q

Quadriplegic patients, iii, 1, 9
Quick Reference Guide for Clinicians, 13

R

Range-of-motion exercises, 22
Reactive hyperemia, 1, 56
Reassessment
of interventions, 22
of mobile patients, 32
of risk, 3, 15.
See also Risk assessment
Rehabilitation programs, 4, 22
Repositioning
definition of, 56–57
effects of, 4, 22–23, 26
written plans for, 23
Research agenda, 35
Ring cushions (donuts), 4–5, 23, 24, 26, 32
Risk assessment
documentation of, 14
need for, 3, 13–14
tools for, 3, 13–17, 31, 32

S

Sacral ulcers, 24
Sebum, 57
Shear, 24, 57
Side-lying positions, 5, 24
Silacore mattress overlay, 25
Skilled care facilities.
See Nursing homes
Skin
care of, 3–4, 15, 18–22, 33
injury to, 4–5, 18, 20–21, 24
inspection of, 3, 15, 18
Skin sealants, 4, 21
Stage I pressure ulcers, iii
description of, 1, 8, 56
prevention of, 2
treatment of, 13
Stage II pressure ulcers
description of, 1, 8, 56
in home care settings, 9–10
Stage III pressure ulcers, 1, 8, 56
Stage IV pressure ulcers, 1, 8, 56
Static support surface, 57
Stratum corneum
definition of, 57
hydration of, 18–19
Support surfaces
dynamic, 55
guidelines for, 4–5, 22–27, 32–33
static, 57

T

Tissue tolerance
definition of, 57
maintenance and improvement of, 8
Topical agents, 3–4, 19, 33, 57
Transparent film dressings, 4, 20–21
Trochanter
definition of, 57
positioning on, 5, 24

U

Underpads, 3, 19

W

Water mattresses, 25
Weight distribution, 5, 26–27

68

Availability of Guidelines

For each clinical practice guideline developed under the sponsorship of the Agency for Health Care Policy and Research (AHCPR), several versions are produced to meet different needs.

The *Guideline Report* contains the *Clinical Practice Guideline* with complete supporting materials, including background information, methodology, literature review, scientific evidence tables, and a comprehensive bibliography.

The *Clinical Practice Guideline* and the *Quick Reference Guide for Clinicians* are companion documents for use as desk-top references for clinical decisionmaking in the day-to-day care of patients. Recommendations, algorithms or flow charts, tables and figures, and pertinent references are included.

A Patient's Guide, available in English and Spanish, is an informational booklet for the general public to increase consumer knowledge and involvement in health care decisionmaking.

Guideline information also will be available for on-line retrieval through the National Library of Medicine, the National Technical Information Service, and some computer-based information systems of professional associations, nonprofit organizations, and commercial enterprises.

To order guideline products or to obtain further information on their availability, call the AHCPR Clearinghouse toll-free at 1–800–358–9295, or write to: AHCPR Publications Clearinghouse, P.O. Box 8547, Silver Spring, MD 20907.

U.S. Department of Health and Human Services
Public Health Service
Agency for Health Care Policy and Research
Executive Office Center, Suite 501
2101 East Jefferson Street
Rockville, MD 20852

AHCPR Publication No. 92-0047
May 1992

BEST COPY AVAILABLE

Clinical Practice Guideline

Quick Reference Guide for Clinicians
Number 3

Pressure Ulcers in Adults: Prediction and Prevention

- Risk Assessment Tools and Risk Factors
- Skin Care and Early Treatment
- Mechanical Loading and Support Surfaces
- Educational Programs
- Staging System
- Algorithm

Pressure Ulcers in Adults

U.S. Department of Health and Human Services
Public Health Service
Agency for Health Care Policy and Research

BEST COPY AVAILABLE

Attention Clinicians

The *Clinical Practice Guideline* on which this *Quick Reference Guide for Clinicians* is based was developed by an interdisciplinary, non-Federal panel comprised of health care professionals and a consumer representative. Panel members were:

Nancy Bergstrom, PhD, RN, FAAN (Chair)
Richard M. Allman, MD
Carolyn E. Carlson, PhD, RN
William Eaglstein, MD
Rita A. Frantz, PhD, RN, FAAN
Susan L. Garber, MA, OTR
Davina Gosnell, PhD, RN, FAAN
Bettie S. Jackson, EdD, MBA, FAAN
Mildred G. Kemp, PhD, RN, CETN, FAAN
Thomas A. Krouskop, PhD
Elena M. Marvel, MSN, MA, RN
George T. Rodeheaver, PhD
George C. Xakellis, MD

For a description of the guideline development process and information about the sponsoring agency (Agency for Health Care Policy and Research), see the *Clinical Practice Guideline, Pressure Ulcers in Adults: Prediction and Prevention* (AHCPR Publication No. 92–0047), Rockville, MD: Agency for Health Care Policy and Research, Public Health Service, U.S. Department of Health and Human Services, May 1992. To receive additional copies of the *Clinical Practice Guideline*, which includes this *Quick Reference Guide* (AHCPR Publication No. 92–0050), and a patient booklet (AHCPR Publication No. 92–0048), call toll free 1–800–358–9295 or write the AHCPR Publications Clearinghouse, P.O. Box 8547, Silver Spring, MD 20907.

AHCPR invites comments and suggestions from users for consideration in development and updating of future guidelines. Please send written comments to Director, Office of the Forum for Quality and Effectiveness in Health Care, AHCPR, Executive Office Center, Suite 401, 2101 East Jefferson Street, Rockville, MD 20852.

Note: This *Quick Reference Guide for Clinicians* contains excerpts from the *Clinical Practice Guideline*, but users should not rely on these excerpts alone. Clinicians should refer to the complete *Clinical Practice Guideline* for a more detailed analysis and discussion of the available research, critical evaluation of the assumptions and knowledge of the field, considerations for patients with special needs, and references. The full *Guideline Report* has a more complete discussion of relevant research, including literature reviews and summary evidence tables.

Purpose and Scope

Pressure ulcers are serious problems that can lead to pain, a longer hospital stay, and a slower recovery. Fortunately, most can be prevented, and Stage I pressure ulcers (nonblanchable erythema of intact skin) that do form need not worsen in most circumstances. However, even the most vigilant nursing care may not prevent the development and worsening of pressure ulcers in some very high-risk individuals. In those cases, intensive therapy must be aimed at reducing risk factors, preventive measures, and treatment.

The purpose of this guideline is to help identify adults at risk of pressure ulcers and to define early interventions for prevention; it may also be used to treat Stage I pressure ulcers. This guideline is not intended as a basis for care of infants and children. The guideline does not apply to individuals with existing Stage II or greater pressure ulcers or to individuals who are fully mobile.

Recommendations target four goals: (1) identifying at-risk individuals who need prevention and the specific factors placing them at risk; (2) maintaining and improving tissue tolerance to pressure in order to prevent injury; (3) protecting against the adverse effects of pressure, friction, and shear; and (4) reducing the incidence of pressure ulcers through educational programs.

A pressure ulcer is defined as any lesion caused by unrelieved pressure that results in damage to underlying tissue. Pressure ulcers usually occur over bony prominences and are graded or staged to classify the degree of tissue damage observed. The staging of pressure ulcers recommended for use by this panel is consistent with the recommendations of the National Pressure Ulcer Advisory Panel (NPUAP):

- *Stage I:* Nonblanchable erythema of intact skin; the heralding lesion of skin ulceration. Note: Reactive hyperemia can normally be expected to be present for one-half to three-fourths as long as the pressure occluded blood flow to the area; it should not be confused with a Stage I pressure ulcer.
- *Stage II:* Partial thickness skin loss involving epidermis and/or dermis. The ulcer is superficial and presents clinically as an abrasion, blister, or shallow crater.
- *Stage III:* Full thickness skin loss involving damage or necrosis of subcutaneous tissue that may extend down to, but not through, underlying fascia. The ulcer presents clinically as a deep crater with or without undermining of adjacent tissue.
- *Stage IV:* Full thickness skin loss with extensive destruction, tissue necrosis or damage to muscle, bone, or supporting structures (for example, tendon or joint capsule). Note: Undermining and sinus tracts may also be associated with Stage IV pressure ulcers.

Staging definitions recognize these limitations:

- Assessment of Stage I pressure ulcers may be difficult in patients with darkly pigmented skin.
- When eschar is present, accurate staging of the pressure ulcer is not possible until the eschar has sloughed or the wound has been debrided.

The guideline is intended for clinicians who examine and treat persons at risk of developing pressure ulcers. These clinicians include family physicians, internists, geriatricians, dieticians, occupational and physical therapists, nurses, and nurse practitioners working in a variety of health care settings such as acute care, rehabilitation, geriatric care, and home- and community-based settings.

After an extensive review of the scientific literature, the panel used the following criteria to grade the evidence supporting each recommendation:

A There is good research-based evidence to support the recommendation.

B There is fair research-based evidence to support the recommendation.

C The recommendation is based on expert opinion and panel consensus.

Risk Assessment Tools and Risk Factors

Goal: Identify at-risk individuals needing prevention and the specific factors placing them at risk.

Bed- and chair-bound individuals or those with impaired ability to reposition should be assessed for additional factors that increase risk for developing pressure ulcers. These factors include immobility, incontinence, nutritional factors such as inadequate dietary intake and impaired nutritional status, and altered level of consciousness. Individuals should be assessed on admission to acute care and rehabilitation hospitals, nursing homes, home care programs, and other health care facilities. A systematic risk assessment can be accomplished by using a validated risk assessment tool such as the Braden Scale or Norton Scale (reproduced here). Pressure ulcer risk should be reassessed periodically. *(Strength of Evidence = A.)* All assessments of risk should be documented. *(Strength of Evidence = C.)*

Norton Scale

		Physical condition	Mental condition	Activity	Mobility	Incontinent	Total score
		Good 4 Fair 3 Poor 2 Very bad 1	Alert 4 Apathetic 3 Confused 2 Stupor 1	Ambulant 4 Walk/help 3 Chairbound 2 Stupor 1	Full 4 Slightly limited 3 Very limited 2 Immobile 1	Not 4 Occasional 3 Usually/urine 2 Doubly 1	
Name	Date						

Source: Doreen Norton, Rhoda McLaren, and A.N. Exton-Smith. An investigation of geriatric nursing problems in the hospital. London. National Corporation for the Care of Old People (now the Centre for Policy on Ageing); 1962. Reprinted with permission.

Braden Scale for Predicting Pressure Sore Risk

Patient's Name		Evaluator's Name
Sensory perception Ability to respond meaningfully to pressure-related discomfort	**1. Completely limited:** Unresponsive (does not moan, flinch, or grasp) to painful stimuli, due to diminished level of consciousness or sedation, OR limited ability to feel pain over most of body surface.	**2. Very limited:** Responds only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness, OR has a sensory impairment which limits the ability to feel pain or discomfort over 1/2 of body.
Moisture Degree to which skin is exposed to moisture	**1. Constantly moist:** Skin is kept moist almost constantly by perspiration, urine, etc. Dampness is detected every time patient is moved or turned.	**2. Moist:** Skin is often but not always moist. Linen must be changed at least once a shift.
Activity Degree of physical activity	**1. Bedfast:** Confined to bed.	**2. Chairfast:** Ability to walk severely limited or nonexistent. Cannot bear own weight and/or must be assisted into chair or wheel chair.
Mobility Ability to change and control body position	**1. Completely immobile:** Does not make even slight changes in body or extremity position without assistance.	**2. Very limited:** Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently.
Nutrition Usual food intake pattern	**1. Very poor:** Never eats a complete meal. Rarely eats more than 1/3 of any food offered. Eats 2 servings or less of protein (meat or dairy products) per day. Takes fluids poorly. Does not take a liquid dietary supplement, OR is NPO[1] and/or maintained on clear liquids or IV[2] for more than 5 days.	**2. Probably inadequate:** Rarely eats a complete meal and generally eats only about 1/2 of any food offered. Protein intake includes only 3 servings of meat or dairy products per day. Occasionally will take a dietary supplement, OR receives less than optimum amount of liquid diet or tube feeding.
Friction and shear	**1. Problem:** Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance. Spasticity, contractures, or agitation leads to almost constant friction.	**2. Potential problem:** Moves feebly or requires minimum assistance. During a move skin probably slides to some extent against sheets, chair, restraints, or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down.

[1]NPO: Nothing by mouth.
[2]IV: Intravenously.
[3]TPN: Total parenteral nutrition.

Source: Barbara Braden and Nancy Bergstrom. Copyright, 1988. Reprinted with permission.

BEST COPY AVAILABLE

		Date of Assessment			
3. Slightly limited: Responds to verbal commands but cannot always communicate discomfort or need to be turned, OR has some sensory impairment which limits ability to feel pain or discomfort in 1 or 2 extremities.	**4. No impairment:** Responds to verbal commands. Has no sensory deficit which would limit ability to feel or voice pain or discomfort.				
3. Occasionally moist: Skin is occasionally moist, requiring an extra linen change approximately once a day.	**4. Rarely moist:** Skin is usually dry; linen requires changing only at routine intervals.				
3. Walks occasionally: Walks occasionally during day but for very short distances, with or without assistance. Spends majority of each shift in bed or chair.	**4. Walks frequently:** Walks outside the room at least twice a day and inside room at least once every 2 hours during waking hours.				
3. Slightly limited: Makes frequent though slight changes in body or extremity position independently.	**4. No limitations:** Makes major and frequent changes in position without assistance.				
3. Adequate: Eats over half of most meals. Eats a total of 4 servings of protein (meat, dairy products) each day. Occasionally will refuse a meal, but will usually take a supplement if offered, OR is on a tube feeding or TPN[3] regimen, which probably meets most of nutritional needs.	**4. Excellent:** Eats most of every meal. Never refuses a meal. Usually eats a total of 4 or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation.				
3. No apparent problem: Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair at all times.					
	Total score				

Skin Care and Early Treatment

***Goal:** Maintain and improve tissue tolerance to pressure in order to prevent injury.*

1. All individuals at risk should have a systematic skin inspection at least once a day, paying particular attention to the bony prominences. Results of skin inspection should be documented. *(Strength of Evidence = C.)*

2. Skin should be cleansed at the time of soiling and at routine intervals. The frequency of skin cleansing should be individualized according to need and/or patient preference. Avoid hot water, and use a mild cleansing agent that minimizes irritation and dryness of the skin. During the cleansing process, care should be used to minimize the force and friction applied to the skin. *(Strength of Evidence = C.)*

3. Minimize environmental factors leading to skin drying, such as low humidity (less than 40 percent) and exposure to cold. Dry skin should be treated with moisturizers. *(Strength of Evidence = C.)*

4. Avoid massage over bony prominences. Current evidence suggests that massage over bony prominences may be harmful. *(Strength of Evidence = B.)*

5. Minimize skin exposure to moisture due to incontinence, perspiration, or wound drainage. When these sources of moisture cannot be controlled, underpads or briefs can be used that are made of materials that absorb moisture and present a quick-drying surface to the skin. For information about assessing and managing urinary incontinence, refer to *Urinary Incontinence in Adults: Clinical Practice Guideline* (available from AHCPR). Topical agents that act as barriers to moisture can also be used. *(Strength of Evidence = C.)*

6. Skin injury due to friction and shear forces should be minimized through proper positioning, transferring, and turning techniques. In addition, friction injuries may be reduced by the use of lubricants (such as corn starch and creams), protective films (such as transparent film dressings and skin sealants), protective dressings (such as hydrocolloids), and protective padding. *(Strength of Evidence = C.)*

7. When apparently well-nourished individuals develop an inadequate dietary intake of protein or calories, caregivers should first attempt to discover the factors compromising intake and offer support with eating. Other nutritional supplements or support may be needed. If dietary intake remains inadequate and if consistent with overall goals of therapy, more aggressive nutritional intervention such as enteral or parenteral feedings should be considered. *(Strength of Evidence = C.)*

For nutritionally compromised individuals, a plan of nutritional support and/or supplementation should be implemented that meets individual needs and is consistent with the overall goals of therapy. *(Strength of Evidence = C.)*

8. If the potential exists for improving the individual's mobility and activity status, rehabilitation efforts should be instituted if consistent with the overall goals of therapy. Maintaining current activity level, mobility, and range of motion is an appropriate goal for most individuals. *(Strength of Evidence = C.)*

9. Interventions and outcomes should be monitored and documented. *(Strength of Evidence = C.)*

Mechanical Loading and Support Surfaces

***Goal:** Protect against the adverse effects of external mechanical forces: pressure, friction, and shear.*

1. Any individual in bed who is assessed to be at risk for developing pressure ulcers should be repositioned at least every 2 hours if consistent with overall patient goals. A written schedule for systematically turning and repositioning the individual should be used. *(Strength of Evidence = B.)*

2. For individuals in bed, positioning devices such as pillows or foam wedges should be used to keep bony prominences (such as knees or ankles) from direct contact with one another, according to a written plan. *(Strength of Evidence = C.)*

3. Individuals in bed who are completely immobile should have a care plan that includes the use of devices that totally relieve pressure on the heels, most commonly by raising the heels off the bed. Do not use donut-type devices. *(Strength of Evidence = C.)*

4. When the side-lying position is used in bed, avoid positioning directly on the trochanter. *(Strength of Evidence = C.)*

5. Maintain the head of the bed at the lowest degree of elevation consistent with medical conditions and other restrictions. Limit the amount of time the head of the bed is elevated. *(Strength of Evidence = C.)*

6. Use lifting devices such as a trapeze or bed linen to move (rather than drag) individuals in bed who cannot assist during transfers and position changes. *(Strength of Evidence = C.)*

7. Any individual assessed to be at risk for developing pressure ulcers should be placed when lying in bed on a pressure-reducing device, such as foam, static air, alternating air, gel, or water mattresses. *(Strength of Evidence = B.)*

8. Any person at risk for developing a pressure ulcer should avoid uninterrupted sitting in any chair or wheelchair. The individual should be repositioned, shifting the points under pressure at least every hour or be put back to bed if consistent with overall patient management goals. Individuals who are able should be taught to shift weight every 15 minutes. *(Strength of Evidence = C.)*

9. For chair-bound individuals, the use of a pressure-reducing device such as those made of foam, gel, air, or a combination is indicated. Do not use donut-type devices. *(Strength of Evidence = C.)*

10. Positioning of chair-bound individuals should include consideration of postural alignment, distribution of weight, balance and stability, and pressure relief. *(Strength of Evidence = C.)*

11. A written plan for the use of positioning devices and schedules may be helpful for chair-bound individuals. *(Strength of Evidence = C.)*

Education

Goal: *Reduce the incidence of pressure ulcers through educational programs.*

1. Educational programs for the prevention of pressure ulcers should be structured, organized, and comprehensive and directed at all levels of health care providers, patients, and family or caregivers. *(Strength of Evidence = A.)*

2. The educational program for prevention of pressure ulcers should include information on the following items *(Strength of Evidence = B)*:

- The etiology of and risk factors for pressure ulcers.
- Risk assessment tools and their application.
- Skin assessment.
- Selection and/or use of support surfaces.
- Development and implementation of an individualized program of skin care.
- Demonstration of positioning to decrease risk of tissue breakdown.
- Instruction on accurate documentation of pertinent data.

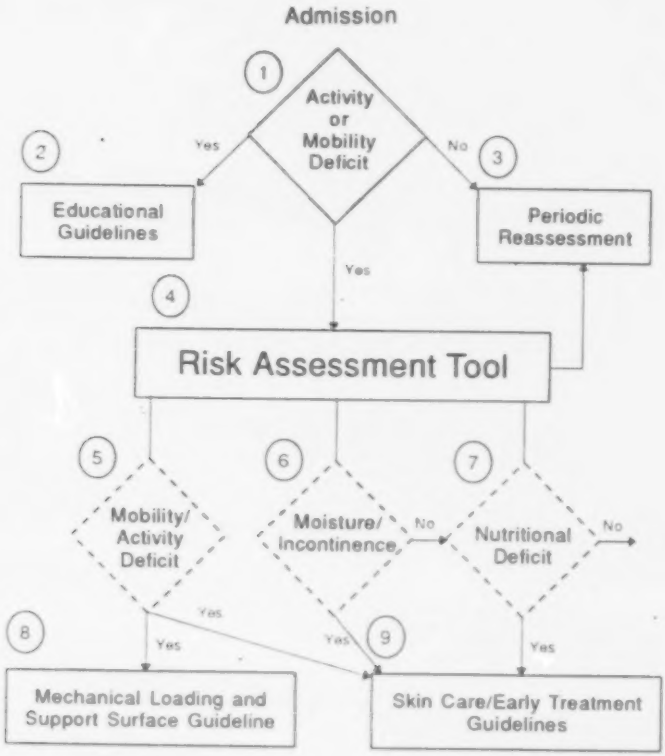
3. The educational program should identify those persons responsible for pressure ulcer prevention, describe each person's role, and be appropriate to the audience in terms of level of information presented and expected participation. The educational program should be updated on a regular basis to incorporate new and existing techniques or technologies. *(Strength of Evidence = C.)*

4. Educational programs should be developed, implemented, and evaluated using principles of adult learning. Programs must have built-in mechanisms such as quality assurance standards and audits to evaluate their effectiveness in preventing pressure ulcers. *(Strength of Evidence = C.)*

Algorithm

The algorithm that follows was developed as a visual display of the conceptual organization, procedural flow, decision points, and preferred management path discussed in the guideline. It begins at the point of admission to an acute care hospital, rehabilitation hospital, nursing home, home care program, or other health care facility or program. Numbers in the algorithm refer to the annotations that follow.

Pressure Ulcer Prediction and Prevention Algorithm



1. **Activity or Mobility Deficit:** Bed- or chair-bound individuals or those whose ability to reposition is impaired should be considered at risk for pressure ulcers. Identification of additional risk factors (immobility, moisture/incontinence, and nutritional deficit) should be undertaken to direct specific preventive treatment regimes.

2. **Educational Program:** Educational programs for the prevention of pressure ulcers should be structured, organized, and comprehensive and directed at all levels of health care providers, patients, and family or caregivers. Refer to Educational Guideline 1–4 (page 11).

3. **Reassessment:** Active, mobile individuals should be periodically reassessed for changes in activity and mobility status. The frequency of reassessment depends on patient status and institutional policy.

4. **Risk Assessment Tools:** Clinicians are encouraged to select and use a method of risk assessment that ensures systematic evaluation of individual risk factors. Many risk assessment tools exist, but only the Norton Scale and Braden Scale have been tested extensively.

   Risk assessment tools include the following risk factors: mobility/activity impairment, moisture/incontinence, and impaired nutrition. Altered level of consciousness (or altered sensory perception) is also identified as a risk factor in most assessment tools. Identification of individual risk factors (boxes 5–7) is helpful in directing care.

5. **Mobility/Activity Deficit:** If there is a deficit, see boxes 8 and 9:

   Mechanical Loading and Support Surfaces (see pages 9–10)

   For bed-bound individuals:
   - Reposition at least every 2 hours.
   - Use pillows or foam wedges to keep bony prominences from direct contact.
   - Use devices that totally relieve pressure on the heels.
   - Avoid positioning directly on the trochanter.
   - Elevate the head of the bed as little and for as short a time as possible.
   - Use lifting devices to move rather than drag individuals during transfers and position changes.
   - Place at-risk individuals on a pressure-reducing mattress. **Do not use donut-type devices.**

   For chair-bound individuals:
   - Reposition at least every hour.
   - Have patient shift weight every 15 minutes if able.

- Use pressure-reducing devices for seating surfaces. **Do not use donut-type devices.**
- Consider postural alignment, distribution of weight, balance and stability, and pressure relief when positioning individuals in chairs or wheelchairs.
- Use a written plan.

Skin Care and Early Treatment (see Guideline 1–4, 6, 8, 9, pages 7–8)

- Inspect skin at least once a day.
- Individualize bathing schedule. Avoid hot water. Use a mild cleansing agent.
- Minimize environmental factors such as low humidity and cold air. Use moisturizers for dry skin.
- Avoid massage over bony prominences.
- Use proper positioning, transferring, and turning techniques.
- Use lubricants to reduce friction injuries.
- Institute a rehabilitation program.
- Monitor and document interventions and outcomes.

6. **Moisture/Incontinence:** If there is moisture or incontinence, see:
Skin Care and Early Treatment (see Guideline 2, 5, page 7)

   Cleanse skin at time of soiling.
   Minimize skin exposure to moisture. Assess and treat urinary incontinence. When moisture cannot be controlled, use underpads or briefs that are absorbent and present a quick-drying surface to the skin.

7. **Nutritional Deficit:** If there is a nutritional deficit, see:

   Skin Care and Early Treatment (see Guideline 7, pages 7–8)

   - Investigate factors that compromise an apparently well-nourished individual's dietary intake (especially protein or calories) and offer him or her support with eating.
   - Plan and implement a nutritional support and/or supplementation program for nutritionally compromised individuals.

Risk should be periodically reassessed. Care should be modified according to the level of risk. Frequency of reassessment depends on patient status and institutional policy.

This document is in the public domain and may be used and reprinted without special permission, except for those copyrighted materials noted for which further reproduction is prohibited without the specific permission of copyright holders. AHCPR appreciates citation as to source, and the suggested format is provided below:

Panel on the Prediction and Prevention of Pressure Ulcers in Adults. *Pressure Ulcers in Adults: Prediction and Prevention. Quick Reference Guide for Clinicians.* AHCPR Publication No. 92–0050. Rockville, MD: Agency for Health Care Policy and Research, Public Health Service, U.S. Department of Health and Human Services. May 1992.

U.S. Department of Health and Human Services
Public Health Service
Agency for Health Care Policy and Research
Executive Office Center, Suite 501
2101 East Jefferson Street
Rockville, MD 20852

AHCPR Publication No. 92-0050
May 1992

BEST COPY AVAILABLE

Preventing Pressure Ulcers

A Patient's Guide

Pressure Ulcers in Adults

88

U.S. Department of Health and Human Services
Public Health Service
Agency for Health Care Policy and Research

BEST COPY AVAILABLE

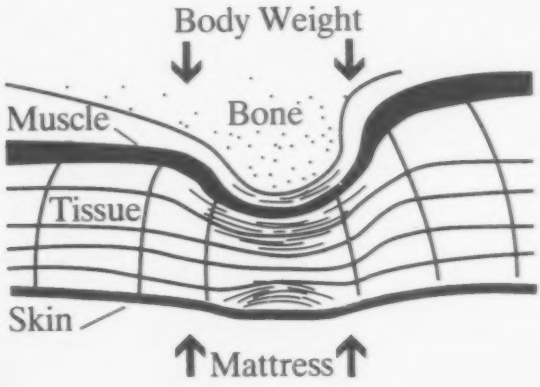
What Are Pressure Ulcers?

A pressure ulcer is an injury usually caused by unrelieved pressure that damages the skin and underlying tissue. Pressure ulcers are also called bed sores and range in severity from mild (minor skin reddening) to severe (deep craters down to muscle and bone).

Unrelieved pressure on the skin squeezes tiny blood vessels, which supply the skin with nutrients and oxygen. When skin is starved of nutrients and oxygen for too long, the tissue dies and a pressure ulcer forms. Skin reddening that disappears after pressure is removed is normal and not a pressure ulcer.

Other factors cause pressure ulcers too. If a person slides down in the bed or chair, blood vessels can stretch or bend and cause pressure ulcers. Even slight rubbing or friction on the skin may cause minor pressure ulcers.

Tissue Under Pressure



Preventing Pressure Ulcers

A Patient's Guide

Purpose of This Booklet

Pressure ulcers are serious problems that can lead to pain, a longer stay in the hospital or nursing home, and slower recovery from health problems. Anyone who must stay in a bed, chair, or wheelchair because of illness or injury can get pressure ulcers.

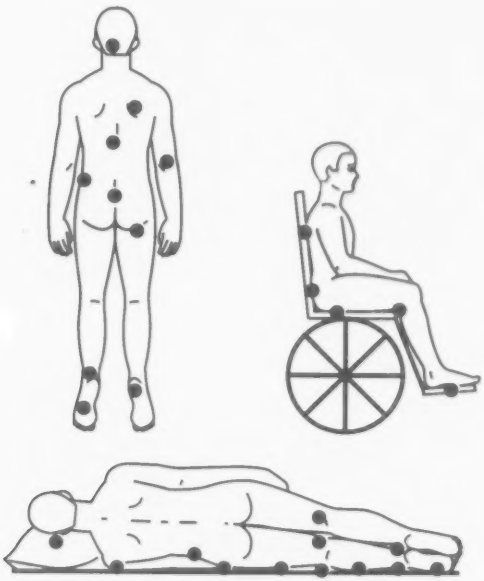
Fortunately, most pressure ulcers can be prevented, and when pressure ulcers do form, they do not have to get worse. This booklet describes where pressure ulcers form and how to tell if you are at risk of getting a pressure ulcer. It also lists steps to take to prevent them or keep them from getting worse, and suggests how to work effectively with your health care team.

Where Pressure Ulcers Form

Pressure ulcers form where bone causes the greatest force on the skin and tissue and squeezes them against an outside surface. This may be where bony parts of the body press against other body parts, a mattress, or a chair. In persons who must stay in bed, most pressure ulcers form on the lower back below the waist (sacrum), the hip bone (trochanter), and on the heels. In people in chairs or wheelchairs, the exact spot where pressure ulcers form depends

on the sitting position. Pressure ulcers can also form on the knees, ankles, shoulder blades, back of the head, and spine.

Nerves normally "tell" the body when to move to relieve pressure on the skin. Persons in bed who are unable to move may get pressure ulcers after as little as 1–2 hours. Persons who sit in chairs and who cannot move can get pressure ulcers in even less time because the force on the skin is greater.



Your Risk

Confinement to bed or a chair, being unable to move, loss of bowel or bladder control, poor nutrition, and lowered mental awareness are "risk factors" that increase your chance of getting pressure ulcers. Your risk results from the number and

seriousness of the risk factors that apply to you.

1. ***Bed or chair confinement.*** If you must stay in bed, a chair, or a wheelchair, the risk of getting a pressure ulcer can be high.
2. ***Inability to move.*** If you cannot change positions without help, you are at great risk. Persons who are in a coma or who are paralyzed or who have a hip fracture are at special risk. Risks of getting pressure ulcers are lower when persons can move by themselves.
3. ***Loss of bowel or bladder control.*** If you cannot keep your skin free of urine, stool, or perspiration, you have a higher risk. These sources of moisture may irritate the skin.
4. ***Poor nutrition.*** If you cannot eat a balanced diet, your skin may not be properly nourished. Pressure ulcers are more likely to form when skin is not healthy.
5. ***Lowered mental awareness.*** When mental awareness is lowered, a person cannot act to prevent pressure ulcers. Mental awareness can be affected by health problems, medications, or anesthesia.

Fortunately, you can lower your risk. Following the steps in this booklet can help you and your health care provider to reduce your risk of pressure ulcers.

Key Steps

The following steps for prevention are based on research, professional judgment, and practice. These steps can also keep pressure ulcers from getting worse. Some steps apply to all prevention efforts; others apply only in specific conditions. It may

help to talk to a nurse or doctor about which steps are right for you.

Take care of your skin

Your skin should be inspected at least once a day. Pay special attention to any reddened areas that remain after you have changed positions and the pressure has been relieved. This inspection can be done by yourself or your caregiver. A mirror can help when looking at hard-to-see areas. Pay special attention to pressure points shown on page 2. The goal is to find and correct problems before pressure ulcers form.

Your skin should be cleaned as soon as it is soiled. A soft cloth or sponge should be used to reduce injury to skin.

Take a bath when needed for comfort or cleanliness. If a daily bath or shower is preferred or necessary, additional measures should be taken to minimize irritation and prevent dry skin. When bathing or showering, warm (not hot) water and a mild soap should be used.

To prevent dry skin:

- Use creams or oils on your skin.
- Avoid cold or dry air.

Minimize moisture from urine or stool, perspiration, or wound drainage. Often urine leaks can be treated. To obtain a copy of *Managing Urinary Incontinence: A Patient's Guide*, call 1–800–358–9295 or write to the AHCPR Publications Clearinghouse, P.O. Box 8547, Silver Spring, MD 20907.

When moisture cannot be controlled:

- Pads or briefs that absorb urine and have a quick drying surface that keeps moisture away from the skin should be used.

93

- A cream or ointment to protect skin from urine, stool, or wound drainage may be helpful.

Protect your skin from injury

Avoid massage of your skin over bony parts of the body. Massage may squeeze and damage the tissue under the skin and make you more likely to get pressure ulcers.

Limit pressure over bony parts by changing positions or having your caregiver change your position.

- If you are in bed, your position should be changed at least every 2 hours.
- If you are in a chair, your position should be changed at least every hour. *(If you are able to shift your own weight, you should do so every 15 minutes while sitting.)*

Reduce friction (rubbing) by making sure you are lifted, rather than dragged, during repositioning. Friction can rub off the top layer of skin and damage blood vessels under the skin. You may be able to help by holding on to a trapeze hanging from an overhead frame (see cover). If nurses or others are helping to lift you, bed sheets or lifters can be used. A thin film of corn starch can be used on the skin to help reduce damage from friction.

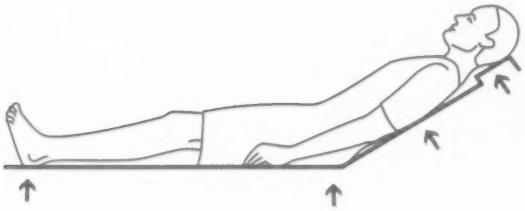
Avoid use of donut-shape (ring) cushions. Donut-shape cushions can increase your risk of getting a pressure ulcer by reducing blood flow and causing tissue to swell.

If you are confined to bed:

- A special mattress that contains foam, air, gel, or water helps to prevent pressure ulcers. The cost and effectiveness of these products vary

greatly. Talk to your health care provider about the best mattress for you.

- The head of the bed should be raised as little (see figure) and for as short a time as possible if consistent with medical conditions and other restrictions. When the head of the bed is raised more than 30 degrees, your skin may slide over the bed surface, damaging skin and tiny blood vessels.



- Pillows or wedges should be used to keep knees or ankles from touching each other.
- Avoid lying directly on your hip bone (trochanter) when lying on your side. Also, a position that spreads weight and pressure more evenly should be chosen—pillows may also help (see figure on next page).
- If you are completely immobile, pillows should be put under your legs from midcalf to ankle to keep heels off the bed. **Never** place pillows behind the knee.

If you are in a chair or wheelchair:

- Foam, gel, or air cushions should be used to relieve pressure. Ask your health care provider which is best for you. Avoid donut-shape cushions because they reduce blood flow and cause tissue to swell, which can increase your risk of getting a pressure ulcer.

- Avoid sitting without moving or being moved.
- Good posture and comfort are important.

Eat well

Eat a balanced diet. Protein and calories are very important. Healthy skin is less likely to be damaged.

If you are unable to eat a normal diet, talk to your health care provider about nutritional supplements that may be desirable.

Improve your ability to move

A rehabilitation program can help some persons regain movement and independence.

Adapted from J. Maklebust. Pressure ulcer update. *RN*, December 1991, pages 56–63. Original illustration by Jack Tandy. Used with permission.

Be Active in Your Care

This booklet tells how to reduce your risk of getting pressure ulcers. Not all steps apply to every person at risk. The best program for preventing pressure ulcers will consider what you want and be based on your condition.

Be sure you:

- Ask questions.
- Explain your needs, wants, and concerns.
- Understand what and why things are being done.
- Know what is best for you. Talk about what you can do to help prevent pressure ulcers—at home, in the hospital, or in the nursing home.

You can help to prevent most pressure ulcers. The extra effort can mean better health.

97

Care by Risk Factors

Risk Factor	Preventive Actions
1. Bed or Chair Confinement	■ Inspect skin at least once a day. ■ Bathe when needed for comfort or cleanliness. ■ Prevent dry skin. ■ For a person in bed: 1. Change position at least every 2 hours. 2. Use a special mattress that contains foam, air, gel, or water. 3. Raise the head of bed as little and for as short a time as possible. ■ For a person in a chair: 1. Change position every hour. 2. Use foam, gel, or air cushion to relieve pressure. ■ Reduce friction by: 1. Lifting rather than dragging when repositioning. 2. Using corn starch on skin. ■ Avoid use of donut-shape cushions. ■ Participate in a rehabilitation program.
2. Inability to Move	■ Persons confined to chairs should be repositioned every hour if unable to do so themselves. ■ For a person in a chair who is able to shift his or her own weight, change position at least every 15 minutes. ■ Use pillows or wedges to keep knees or ankles from touching each other.

Care by Risk Factors

Risk Factor	Preventive Actions
2. Inability to Move (Continued)	■ When in bed, place pillow under legs from midcalf to ankle to keep heels off the bed.
3. Loss of Bowel or Bladder Control	■ Clean skin as soon as soiled. ■ Assess and treat urine leaks. ■ If moisture cannot be controlled: 1. Use absorbent pads and/or briefs with a quick-drying surface. 2. Protect skin with a cream or ointment.
4. Poor Nutrition	■ Eat a balanced diet. ■ If a normal diet is not possible, talk to health care provider about nutritional supplements.
5. Lowered Mental Awareness	■ Choose preventive actions that apply to the person with lowered mental awareness. For example, if the person is chair-bound, refer to the specific preventive actions outlined in Risk Factor 1.

Additional Resources

National and international organizations provide a variety of resources for people concerned with pressure ulcers.

International Association of Enterostomal Therapy
(Will refer patients to local Enterostomal Therapy Nurses)
27241 La Paz Road, Suite 121
Laguna Niguel, CA 92656
714–476–0268

National Pressure Ulcer Advisory Panel
(Offers information for caregivers, families providing care at home, and others)
SUNY at Buffalo
Beck Hall
3435 Main Street
Buffalo, NY 14214
716–831–2143

For More Information

The information in this booklet was taken from the *Clinical Practice Guideline* on *Pressure Ulcers in Adults: Prediction and Prevention.* The guideline was developed by an expert panel of doctors, nurses, other health care providers, and a consumer representative, and it was sponsored by the Agency for Health Care Policy and Research. Other guidelines on common health problems are being developed and will be released in the near future. For more information about the guidelines or to receive more copies of this booklet, call toll free 1–800–358–9295 or write to:

Agency for Health Care Policy and Research
Publications Clearinghouse
P.O. Box 8547
Silver Spring, MD 20907

U.S. Department of Health and Human Services
Public Health Service
Agency for Health Care Policy and Research
Executive Office Center, Suite 501
2101 East Jefferson Street
Rockville, MD 20852

AHCPR Publication No. 92-0048
May 1992

BEST COPY AVAILABLE